STATUS OF POTENTIALLY AFFECTED SPECIES
BY OCEAN BASIN

DATA FOR THE STATUS OF EACH SPECIES WERE TAKEN DIRECTLY AND SYNTHESIZED FROM THE 2008 NOAA ATLANTIC, PACIFIC, AND ALASKA STOCK ASSESSMENT REPORTS

http://www.nmfs.noaa.gov/pr/sars/region.htm
http://www.nefsc.noaa.gov/publications/tm/tm210/
http://www.nmfs.noaa.gov/pr/pdfs/sars/po2008.pdf
http://www.nmfs.noaa.gov/pr/pdfs/sars/ak2008.pdf

SPECIES LIST

NORTH PACIFIC
Blue Whale *(Balaenoptera musculus)*
Fin Whale *(Balaenoptera physalus*)
Humpback whale (*Megaptera novaeangliae*)
Sei Whale (*Balaenoptera borealis*)
Bryde's Whale (*Balaenoptera edeni*)
Gray Whale (*Eschrichtius robustus*)
Minke Whale (*Balaenoptera acutorostrata*)
Sperm Whale (*Physeter macrocephalus*)
Killer Whale (*Orcinus orca*)
Short-finned Pilot Whale (*Globicephala macrorhynchus*)
Melon-headed Whale (*Peponocephala electra*)
False Killer Whale (*Pseudorca crassidens*)
Pygmy Killer Whale (*Feresa attenuata*)
Dwarf Sperm Whale (*Kogia sima*)
Pygmy Sperm Whale (*Kogia breviceps*)
Risso's Dolphin (*Grampus griseus*)
Short-beaked Common Dolphin (*Delphinus delphis*)
Long-beaked Common Dolphin (*Delphinus capensis*)
Pacific White-Sided Dolphin (*Lagenorhynchus obliquidens*)
Rough-Toothed Dolphin (*Steno bredanensis*)
Striped Dolphin (*Stenella coeruleoalba*)
Pantropical Spotted Dolphin (*Stenella attenuata*)
Spinner Dolphin (*Stenella longirostris*)
Bottlenose Dolphin (*Tursiops truncatus*)
Fraser's Dolphin (*Lagenodelphis hosei*)
Blainville's Beaked Whale (*Mesoplodon densirostris*)
Cuvier's Beaked Whale (*Ziphius cavirostris*)
Baird's Beaked Whale (*Berardius bairdii*)
Longman's Beaked Whale (*Indopacetus pacificus*)

NORTH PACIFIC

Blue Whale (*Balaenoptera musculus*)

The International Whaling Commission (IWC) has formally considered only one management stock for blue whales in the North Pacific (Donovan 1991), but this ocean is thought to include more than one population (Ohsumi and Wada 1972; Braham 1991), possibly as many as five (Reeves et al. 1998). Blue whales in the North Pacific produce two distinct, stereotypic calls that have been termed the northwestern and northeastern call types, and it has been proposed that these represent two distinct populations with some degree of geographic overlap (Stafford et al. 2001). The northeastern call predominates in the Gulf of Alaska, the U.S. West Coast, and the eastern tropical Pacific, and the northwestern call predominates from south of the Aleutian Islands to the Kamchatka Peninsula in Russia (Stafford et al. 2001). Both call types are represented in lower latitudes in the central North Pacific but differ in their seasonal patterns (Stafford et al. 2001). Whaling catch data indicate that whales feeding along the Aleutian Islands are probably part of a central Pacific stock (Reeves et al. 1998), which may migrate to offshore waters north of Hawaii in winter (Berzin and Rovnin 1966). The only published sighting record of blue whales near Hawaii is that of Berzin and Rovnin (1966).

For the Marine Mammal Protection Act (MMPA) stock assessment reports, the eastern North Pacific Stock of blue whales includes animals found in the eastern North Pacific from the northern Gulf of Alaska to the eastern tropical Pacific.). Blue whales belonging to the western Pacific stock appear to feed in summer southwest of Kamchatka, south of the Aleutians, and in the Gulf of Alaska (Stafford 2003; Watkins et al. 2000b), and in winter they migrate to lower latitudes in the western Pacific and less frequently in the central Pacific, including Hawaii (Stafford et al. 2001).

The reported take of North Pacific blue whales by commercial whalers totaled 9,500 between 1910 and 1965 (Ohsumi and Wada 1972). Approximately 3,000 of these were taken from the west coast of North America from Baja California, Mexico to British Columbia, Canada (Tonnessen and Johnsen 1982; Rice 1992; Clapham et al. 1997; Rice 1974). Blue whales in the North Pacific were given protected status by the IWC in 1966, but Doroshenko (2000) reported that a small number of blue whales were taken illegally by Soviet whalers after that date. As a result of commercial whaling, blue whales were formally listed as "endangered" under the Endangered Species Act (ESA) in 1973. They are still listed as "endangered", and consequently the eastern North Pacific stock is automatically considered as a "depleted" and "strategic" stock under the MMPA. The status of blue whales in Hawaiian waters relative to OSP is

unknown, and there are insufficient data to evaluate trends in abundance. Blue whales are formally listed as "endangered" under the Endangered Species Act (ESA), and consequently the Hawaiian stock is automatically considered as a "depleted" and "strategic" stock under the MMPA.

Fin Whale (*Balaenoptera physalus*)

The International Whaling Commission (IWC) recognized two stocks of fin whales in the North Pacific: the East China Sea and the rest of the North Pacific (Donovan 1991). Mizroch et al. (1984) cites evidence for additional fin whale subpopulations in the North Pacific. From whaling records, fin whales that were marked in winter 1962-70 off southern California were later taken in commercial whaling operations between central California and the Gulf of Alaska in summer (Mizroch et al. 1984). More recent observations show aggregations of fin whales year round in southern/central California (Dohl et al. 1983; Barlow 1997; Forney et al. 1995), year-round in the Gulf of California (Tershy et al. 1993), in summer in Oregon (Green et al. 1992; McDonald 1994), and in summer/autumn in the Shelikof Strait/Gulf of Alaska (Brueggeman et al. 1990). Acoustic signals from fin whale are detected year round off northern California, Oregon and Washington, with a concentration of vocal activity between September and February (Moore et al. 1998). Fin whales appear very scarce in the eastern tropical Pacific in summer (Wade and Gerrodette 1993) and winter (Lee 1993).

Large numbers of fin whales were taken by commercial whalers throughout the North Pacific from the early 20th century until the 1970s (Tønnessen and Johnsen 1982). Approximately 46,000 fin whales were taken from the North Pacific by commercial whalers between 1947 and 1987 (C. Allison, IWC, pers. comm.). Some of these whales may have been from a population or populations that migrate seasonally into the Hawaiian EEZ. The species has been protected in the North Pacific by the IWC since 1976.

The Marine Mammal Protection Act (MMPA) stock assessment recognizes three stocks of fin whales in the North Pacific: 1) the Hawaii stock, 2) the California/Oregon/Washington stock, and 3) the Alaska stock. The initial pre-whaling population of fin whales in the North Pacific was estimated to be 42,000- 45,000 (Ohsumi and Wada 1974). In 1973, the North Pacific population was estimated to have been reduced to 13,620-18,680 (Ohsumi and Wada 1974), of which 8,520-10,970 was estimated to belong to the eastern Pacific stock.

California, Oregon, Washington A minimum of 148 individually identified fin whales are found in the Gulf of California (Tershy et al. 1990). Recently 2,118 (CV=0.18) fin whales were estimated to be off California, Oregon and

Washington based on ship surveys in summer/autumn of 2001 (Barlow and Forney 2007) A 2005 ship survey of the same area resulted in an abundance estimate of 3,281 (CV=0.25) fin whales (Forney 2007). The best estimate of fin whale abundance in California, Oregon, and Washington waters out to 300 nmi is the geometric mean of line transect estimates from summer/autumn ship surveys conducted in 2001 (Barlow and Forney 2007) and 2005 (Forney 2007), or 2,636 (CV = 0.15) whales. This is probably an underestimate because it almost certainly excludes some fin whales which could not be identified in the field and which were recorded as "unidentified rorqual" or "unidentified large whale".

Fin whales in the entire North Pacific were estimated to be at less than 38% (16,625 out of 43,500) of historic carrying capacity (Mizroch et al. 1984). The initial abundance has never been estimated separately for the "west coast" stock, but this stock was also probably depleted by whaling. Approximately 46,000 fin whales were taken from the North Pacific by commercial whalers between 1947 and 1987 (C. Allison, IWC, pers. comm.). Approximately 5,000 fin whales were taken from the west coast of North America from 1919 to 1965 (Rice 1974; Tonnessen and Johnsen 1982; Clapham et al. 1997). Fin whales in the North Pacific were given protected status by the IWC in 1976. Fin whales are formally listed as "endangered" under the Endangered Species Act (ESA), and consequently the California to Washington stock is automatically considered as a "depleted" and "strategic" stock under the MMPA. The total incidental mortality due to fisheries (zero) and ship strikes (1.6/yr) is less than the calculated PBR (14). Total fishery mortality is less than 10% of PBR and, therefore, may be approaching zero mortality and serious injury rate. There is some indication that the population may be growing. Increasing levels of anthropogenic sound in the world's oceans has been suggested to be a habitat concern for whales, particularly for baleen whales that may communicate using low-frequency sound (Croll *et al.* 2002).

Hawai`i Fin whales are rare in Hawaiian waters. Balcomb (1987) observed 8-12 fin whales in a multi-species feeding assemblage on 20 May 1966 approx. 250 mi. south of Honolulu. Additional sightings were reported north of Oahu in May 1976 and in the Kauai Channel in February 1979 (Shallenberger 1981) and a single fin whale was observed north of Kaua`i in February 1994 (Mobley et al. 1996). A single stranding has been reported on Maui (Shallenberger 1981). Thompson and Friedl (1982; and see Northrop et al. 1968) suggested that fin whales migrate into Hawaiian waters mainly in fall and winter, based on acoustic recordings off Oahu and Midway Islands. McDonald and Fox (1999) reported an average of 0.027 calling fin whales per 1000 km^2 (grouped by 8-hr periods) based on passive acoustic recordings within about 16 km of the north shore of Oahu.

As part of the Marine Mammal Research Program of the Acoustic Thermometry of Ocean Climate (ATOC) study, a total of twelve aerial surveys were conducted within about 25 nmi of the main Hawaiian Islands in 1993-98 (Mobley et al. 2000). Only one sighting of a single fin whale was made (Mobley et al. 1996), and therefore no meaningful abundance estimate could be calculated. With the inclusion of additional aerial surveys in 2000 and 2003, the total sightings over a 10-year span (1993-2003) consisted of 3 fin whales (Mobley, unpublished). The status of fin whales in Hawaiian waters relative to OSP is unknown, and there are insufficient data to evaluate trends in abundance. Fin whales are formally listed as "endangered" under the Endangered Species Act (ESA), and consequently the Hawaiian stock is automatically considered as a "depleted" and "strategic" stock under the MMPA.

Using passive acoustic detections from a hydrophone north of Oahu, MacDonald and Fox (1999) estimate an average density of 0.027 calling fin whales per 1000 km^2 within about 16 km from shore. However, the relationship between the number of whales present and the number of calls detected is not known, and therefore this acoustic method does not provide an estimate of absolute abundance for fin whales.

Alaska Recent surveys in the central-eastern and southeastern Bering Sea in 1999 and 2000 and in coastal waters of the Aleutian Islands and the Alaska Peninsula from 2001 to 2003 resulted in new information about the distribution and relative abundance of fin whales in these areas (Moore et al. 2000, 2002; Zerbini et al. 2006). Fin whale abundance estimates were nearly five times higher in the central-eastern Bering Sea than in the southeastern Bering Sea (Moore et al. 2002), and most sightings in the central-eastern Bering Sea occurred in a zone of particularly high productivity along the shelf break (Moore et al. 2000). The fin whale is listed as “endangered” under the Endangered Species Act of 1973, and therefore designated as “depleted” under the MMPA. As a result, the Northeast Pacific stock is classified as a strategic stock. While reliable estimates of the minimum population size, population trends, and PBR are available for a portion of this stock, much of the North Pacific range has not been surveyed. Therefore the status of the stock relative to its Optimum Sustainable Population size is currently not available.

Humpback whale (*Megaptera novaeangliae*)

Although the International Whaling Commission (IWC) only considered one stock (Donovan 1991), there is now good evidence for multiple populations of humpback whales in the North Pacific (Johnson and Wolman 1984; Baker

et al. 1990). Humpback whales in the North Pacific feed in coastal waters from California to Russia and in the Bering Sea. They migrate south to wintering destinations off Mexico, Central America, Hawaii, southern Japan, and the Philippines. Mitochondrial and nuclear genetic markers show that considerable structure exists in humpback whale populations in the North Pacific (Baker et al. 1998). Significant levels of mitochondrial and nuclear genetic differences were found between central California and Southeast Alaska feeding areas (Baker et al. 1998). The North Pacific total now almost certainly exceeds 6,000 humpback whales (Calambokidis et al. 1997).

California, Oregon, Washington Barlow and Forney (2007) estimated 1,096 (CV= 0.22) humpbacks in California, Oregon, and Washington waters based on summer/fall ship line-transect surveys in 2001. Forney (2007) estimated 1,769 (CV=0.16) humpbacks in the same region based on a 2005 summer/fall ship line-transect survey, which included additional fine-scale coastal strata not included in the 2001 survey. The combined 2001 and 2005 line- transect estimate of abundance is the geometric mean of the two annual estimates, or 1,392 (CV=0.13). Calambokidis et al. (2004) estimated humpback whale abundance in these feeding areas from 1991 to 2003 using Petersen mark-recapture estimates based on photo-identification collections in adjacent pairs of years. These data show a general upward trend in abundance followed by a large (but not statistically significant) drop in the 1999/2000 and 2000/2001 estimates. The 2002/2003 mark recapture population estimate (1,391, CV=0.22) is higher than any previous mark-recapture estimates and may indicate that the apparent decline in the previous two estimates exaggerates any real decline that might have occurred (Calambokidis et al. 2003) or that a real decline was followed by an influx of new whales from another area (Calambokidis et al. 2004). This latter view is substantiated by the greater fraction of new whales seen for the first time in 2003 (Calambokidis et al. 2004). In general mark-recapture estimates are negatively biased due to heterogeneity in sighting probabilities (Hammond 1986); however, this bias is likely to be minimal because the above mark-recapture estimate is based on data from nearly half of the entire population (the 2002/2003 data contained 542 known individuals). The best estimate of abundance is the un-weighted geometric mean of 2002/2003 mark-recapture and 2001-2005 line-transect estimates, or 1,391 (CV=0.13) whales.

Hawai`i Aerial surveys of humpback whales conducted throughout the major Hawaiian Islands during the 1993, 1995, 1998 and 2000 winter seasons (Mobley et al., 2001) yielded the following abundance estimates. Corrected population estimates were as follows: **1993**: 2,754 (95% CI: 2,044-3,463); **1995**: 3,776 (95% CI: 2,925-4,627); **1998**: 4,358 (95% CI: 3,261-5,454); **2000**: 4,491 (95% CI: 3,146-5,836). Regression analysis

revealed a significant linear trend of increasing densities across the seven-year intervening period [$F(1,2) = 18.72$, $p < .05$] with an average increase of 7% per year. This suggests that the wintering humpback whale population will double in size approximately every 13 years and is consistent with the earlier report of Calambokidis et al. (1997b), based on photographic mark and recapture results, which revealed a 6-8% annual increase for humpbacks in feeding grounds off the coasts of Washington, Oregon and California from the period 1988-98. If the estimated rate of annual increase of 7% can be applied to subsequent years, then the current estimated abundance for year 2004 would be approximately 5,900 whales.

Alaska A vessel survey for cetaceans was conducted in the central Bering Sea in July-August 1999 in cooperation with research on commercial fisheries (Moore et al. 2000). The survey included 6,043 nmi of tracklines, most of which were West of St. Matthew Island, north of the 200 m bathymetric contour, and south of the U.S./Russia Convention Line. Ten on-effort sightings of humpback whales occurred during this survey, the majority of which took place along the eastern Aleutian chain and near the U.S./Russian Convention Line just south of St. Lawrence Island. If these localized sightings are extrapolated to the entire survey area, an estimated abundance of 1,175 humpback whales (95% CI: 197-7,009) occur in the central Bering Sea during the summer. However, Moore et al. (2002) determined that these sightings were too clumped in the central-eastern Bering Sea to be used to provide a reliable estimate for the area and decided to improve upon the method used to stratify the data in the analysis. Sightings of humpback whales also occurred during the survey conducted in the eastern Bering Sea in 2000; these sightings resulted in an estimated abundance of 102 (95% CI: 40-262). It is unknown whether these animals belong to the central or western North Pacific stock of humpback whales. Photo-identification studies initiated to the west of Kodiak Island from 1999 to 2002 identified 171 individual humpback whales, which resulted in a mark-recapture estimate of 410 (95% CI: 241-683).

The central North Pacific stock of humpback whales consists of feeding aggregations along the northern Pacific Rim, and some humpbacks are present offshore in the Gulf of Alaska, Bering Sea and above the Bering Strait (Brueggeman et al. 1989; Mizroch and Rice, 2007 abstract, Moore et al. 2002). As a result, the central North Pacific stock of humpback whale is classified as a strategic stock.

As a result of commercial whaling, humpback whales were formally listed as "endangered" under the Endangered Species Act (ESA) in 1973. The species is still listed as “endangered”, and consequently the California/Mexico stock is automatically considered as a "depleted" and "strategic" stock under the

MMPA. The eastern North Pacific stock appears to be increasing in abundance.

Sei Whale (*Balaenoptera borealis*)

The International Whaling Commission (IWC) only considers one stock of sei whales in the North Pacific (Donovan 1991), but some evidence exists for multiple populations (Masaki 1977; Mizroch et al. 1984; Horwood 1987). There is still insufficient information to accurately determine population structure, but from a conservation perspective it may be risky to assume panmixia in the entire North Pacific. Four sightings of sei whales were recently made during a summer/fall 2002 shipboard survey of waters within the U.S. Exclusive Economic Zone (EEZ) of the Hawaiian Islands (Figure 1; Barlow 2003). For the Marine Mammal Protection Act (MMPA) stock assessment reports, sei whales within the Pacific U.S. EEZ are divided into three discrete, non-contiguous areas: 1) waters around Hawaii (this report), 2) California, Oregon and Washington waters, and 3) Alaskan waters.

Ohsumi and Wada (1974) estimate the pre-whaling abundance of sei whales to be 58,000-62,000 the North Pacific. Later, Tillman (1977) used a variety of different methods to estimate the abundance of sei whales in the North Pacific and revised this pre-whaling estimate to 42,000. His estimates for the year 1974 ranged from 7,260 to 12,620. All methods depend on using the history of catches and trends in CPUE or sighting rates; there have been no direct estimates of sei whale abundance in the entire (or eastern) North Pacific based on sighting surveys. Only five confirmed sightings of sei whales were made in California, Oregon, and Washington waters during extensive ship and aerial surveys between 1991-2005 (Hill and Barlow 1992; Carretta and Forney 1993; Mangels and Gerrodette 1994; Von Saunder and Barlow 1999; Barlow 2003; Forney 2007). Green et al. (1992) did not report any sightings of sei whales in aerial surveys of Oregon and Washington. Abundance estimates for the two most recent line transect surveys of California, Oregon, and Washington waters out to 300 nmi are 29 (CV=1.00) and 74 (CV=0.88) sei whales, respectively (Barlow and Forney 2007, Forney 2007). The best estimate of abundance for California, Oregon, and Washington waters out to 300 nmi is the un-weighted geometric mean of the 2001 and 2005 estimates, or 46 (CV = 0.61) sei whales (Barlow and Forney 2007; Forney 2007). There are no abundance estimates for sei whales along the west coast of the U.S. or in the eastern North Pacific. Only one sighting of a Sei whale was reported in Hawaii in 2001 (Salden, pers. comm).

As part of the Marine Mammal Research Program of the Acoustic Thermometry of Ocean Climate (ATOC) study, a total of twelve aerial surveys were conducted within about 25 nmi of the main Hawaiian Islands in

1993-98 (Mobley et al. 2000), but no sightings of sei whales were made. A 2002 shipboard line-transect survey of the entire Hawaiian Islands EEZ resulted in a summer/fall abundance estimate of 77 (CV=1.06) sei whales (Barlow 2003). This is currently the best available abundance estimate for this stock, but the majority of sei whales would be expected to be at higher latitudes in their feeding grounds at this time of year. Previously, sei whales were estimated to have been reduced to 20% (8,600 out of 42,000) of their prewhaling abundance in the North Pacific (Tillman 1977). Sei whales are formally listed as "endangered" under the Endangered Species Act (ESA), and consequently the Hawaiian stock is automatically considered as a "depleted" and "strategic" stock under the MMPA.

There has been an IWC prohibition on taking sei whales since 1976, and commercial whaling in the U.S. has been prohibited since 1972. Sei whales are formally listed as "endangered" under the Endangered Species Act (ESA), and consequently the eastern North Pacific stock is automatically considered as a "depleted" and "strategic" stock under the Marine Mammal Protection Act (MMPA). Increasing levels of anthropogenic sound in the world's oceans has been suggested to be a habitat concern for whales, particularly for baleen whales that may communicate using low-frequency sound (Croll et al. 2002).

Bryde's Whale (*Balaenoptera edeni*)

Bryde's whales occur in tropical and warm temperate waters throughout the world. Shallenberger (1981) reported a sighting of a Bryde's whale southeast of Nihoa in April 1977 (see DeLong and Brownell 1977). A summer/fall 2002 shipboard survey of waters within the U.S. Exclusive Economic Zone (EEZ) of the Hawaiian Islands resulted in 13 Bryde's whale sightings throughout the study area (Barlow 2003). With presently available evidence, there is no biological basis for defining separate stocks of Bryde's whales in the central North Pacific. Bryde's whales also occasionally occur off southern California (Morejohn and Rice 1973). For the MMPA stock assessment reports, Bryde's whales within the Pacific U.S. EEZ are divided into two areas: 1) Hawaiian waters (this report), and 2) the eastern tropical Pacific (east of 150°W and including the Gulf of California and waters off California).

Tillman (1978) concluded from Japanese and Soviet CPUE data that the stock size in the North Pacific pelagic whaling grounds, mostly to the west of the Hawaiian Islands, declined from approximately 22,500 in 1971 to 17,800 in 1977. An estimate of 13,000 (CV=0.202) Bryde's whales was made from vessel surveys in the eastern tropical Pacific between 1986 and 1990 (Wade and Gerrodette 1993). The area to which this estimate applies is mainly east

and somewhat south of the Hawaiian Islands, and it is not known whether these animals are part of the same population that occurs around the Hawaiian Islands. As part of the Marine Mammal Research Program of the Acoustic Thermometry of Ocean Climate (ATOC) study, a total of twelve aerial surveys were conducted within about 25 nmi of the main Hawaiian Islands in 1993, 1995 and 1998 (Mobley et al. 2000). No sightings of Bryde's whales were made. A 2002 shipboard line-transect survey of the entire Hawaiian Islands EEZ resulted in an abundance estimate of 493 (CV=0.34) Bryde's whales (Barlow 2003). This is currently the best available abundance estimate for this stock.

The status of Bryde's whales in Hawaiian waters relative to OSP is unknown, and there are insufficient data to evaluate trends in abundance. They are not listed as "threatened" or "endangered" under the Endangered Species Act (1973), nor as "depleted" under the MMPA. The Hawaiian stock of Bryde's whale is not considered strategic under the 1994 amendments to the MMPA because there has been no reported fisheries related mortality or serious injury.

Gray Whale (*Eschrichtius robustus*)

Gray whales formerly occurred in the North Atlantic Ocean (Fraser 1970, Mead and Mitchell 1984), but this species is currently found only in the North Pacific (Rice et al. 1984, Swartz et al. 2006). The following information was considered in classifying stock structure of gray whales based on the phylogeographic approach of Dizon et al. (1992): 1) Distributional data: two isolated geographic distributions in the North Pacific Ocean; 2) Population response data: the eastern North Pacific population has increased, and no evident increase in the western North Pacific; 3) Phenotypic data: unknown; and 4) Genotypic data: unknown. Based on this limited information, two stocks have been recognized in the North Pacific: the Eastern North Pacific stock, which lives along the west coast of North America, and the Western North Pacific or "Korean" stock, which lives along the coast of eastern Asia (Rice 1981, Rice et al. 1984, Swartz et al. 2006).

Most of the Eastern North Pacific stock spends the summer feeding in the northern and western Bering and Chukchi Seas (Rice and Wolman 1971, Berzin 1984, Nerini 1984). Each fall, the whales migrate south along the coast of North America from Alaska to Baja California, in Mexico (Rice and Wolman 1971), most of them starting in November or December (Rugh et al. 2001). The Eastern North Pacific stock winters mainly along the west coast of Baja California, using certain shallow, nearly landlocked lagoons and bays, and calves are born from early January to mid-February (Rice et al. 1981), often seen on the migration well north of Mexico (Shelden et al.

2004). The northbound migration generally begins in mid-February and continues through May (Rice et al. 1981, 1984; Poole 1984a), with cows and newborn calves migrating northward primarily between March and June along the U.S. West Coast.

Systematic counts of gray whales migrating south along the central California coast have been conducted by shore-based observers at Granite Canyon most years since 1967. The most recent abundance estimates are based on counts made during the 1997-98, 2000-01, and 2001-02 southbound migrations. Analyses of these data resulted in abundance estimates of 29,758 for 1997-98, 19,448 for 2000-01, and 18,178 for 2001-02 (Rugh et al. 2005). Prior estimates were: 22,263 (CV = 9.25%) whales in 1995-96 (Hobbs et al. 2004), 23,109 (CV = 5.42%) whales in 1993-94 (Laake et al. 1994) and 21,296 (CV = 6.05%) whales in 1987-88 (Buckland et al. 1993).

In 1994, due to steady increases in population abundance, the eastern North Pacific stock of gray whales was removed from the List of Endangered and Threatened Wildlife (the List), as it was no longer considered endangered or threatened under the Endangered Species Act (ESA). As required by the ESA, NMFS monitored the status of this stock for 5 years following delisting. A workshop convened by NMFS on 16-17 March 1999 at the AFSC's National Marine Mammal Laboratory in Seattle, WA, reviewed the status of the stock based on research conducted during the 5-year period following delisting. Invited workshop participants determined that the stock was neither in danger of extinction, nor likely to become endangered within the foreseeable future, therefore there was no apparent reason to reverse the previous decision to remove this stock from the List (Rugh et al. 1999). This recommendation was subsequently adopted by NMFS.

Minke Whale (*Balaenoptera acutorostrata*)

The International Whaling Commission (IWC) recognizes 3 stocks of minke whales in the North Pacific: one in the Sea of Japan/East China Sea, one in the rest of the western Pacific west of 180°N, and one in the "remainder of the Pacific (Donovan 1991). The "remainder" stock only reflects the lack of exploitation in the eastern Pacific and does not imply that only one population exists in that area (Donovan 1991). In the "remainder" area, minke whales are relatively common in the Bering and Chukchi seas and in the Gulf of Alaska, but are not considered abundant in any other part of the eastern Pacific (Leatherwood et al. 1982; Brueggeman et al. 1990). No estimates have been made for the number of minke whales in the entire North Pacific. For the Marine Mammal Protection Act (MMPA) stock assessment reports, there are three stocks of minke whale within the Pacific

U.S. EEZ: 1) a Hawaiian stock (this report), 2) a California/Oregon/ Washington stock, and 3) an Alaskan stock. They are not listed as "threatened" or "endangered" under the Endangered Species Act (1973), nor as "depleted" under the MMPA.

California, Oregon, Washington In the Pacific, minke whales are usually seen over continental shelves (Brueggeman et al. 1990). In the extreme north, minke whales are believed to be migratory, but in inland waters of Washington and in central California they appear to establish home ranges (Dorsey et al. 1990). Minke whales occur year round in California (Dohl et al. 1983; Forney et al. 1995; Barlow 1997) and in the Gulf of California (Tershy et al. 1990). Minke whales are present at least in summer/fall along the Baja California peninsula (Wade and Gerrodette 1993). Because the "resident" minke whales from California to Washington appear behaviorally distinct from migratory whales further north, minke whales in coastal waters of California, Oregon, and Washington (including Puget Sound) are considered as a separate stock.

The number of minke whales off California Oregon, and Washington is estimated to be the geometric mean of two recent ship line transect surveys conducted in summer and autumn of 2001 and 2005 (Barlow and Forney 2007; Forney 2007); or 806 (CV = 0.63) whales. Two minke whales were seen during 1996 aerial surveys in Washington and British Columbia inland waters (Calambokidis et al. 1997), but no abundance estimates are available for this area. The greatest uncertainty in their status is whether entanglement in commercial gillnets and ship strikes could have reduced this relatively small population. Because of this, the status of the west-coast stock is considered "unknown".

Hawai`i Minke whales have only been recently confirmed to occur seasonally around the Hawaiian Islands (Barlow 2003, Rankin and Barlow, in prep), and their migration routes or destinations are not known. One confirmed sighting of a minke whale was made in November 2002 during a survey of waters within the U.S. Exclusive Economic Zone (EEZ) of the Hawaiian Islands (Barlow 2003), and additional acoustic detections of this species' distinctive call (known as the 'boing') were made that could not be visually verified. There currently is no abundance estimate for this stock of minke whales, which appears to occur seasonally (about November - March) around the Hawaiian Islands. The status of minke whales in Hawaiian waters relative to OSP is unknown, and there are insufficient data to evaluate trends in abundance.

Alaska A visual survey for cetaceans was conducted in the central-eastern Bering Sea in July-August 1999, and in the southeastern Bering Sea in 2000,

in cooperation with research on commercial fisheries (Moore et al. 2000; Moore et al. 2002; see Fig. 40 for locations of survey areas). The survey included 1,761 km and 2,194 km of effort in 1999 and 2000, respectively. Results of the surveys in 1999 and 2000 provide provisional abundance estimates of 810 (CV = 0.36) and 1,003 (CV = 0.26) minke whales in the central-eastern and southeastern Bering Sea, respectively (Moore et al. 2002). These estimates are considered provisional because they have not been corrected for animals missed on the trackline, animals submerged when the ship passed, or responsive movement. These estimates cannot be used as an estimate of the entire Alaska stock of minke whales because only a portion of the stock's range was surveyed.

The greatest uncertainty regarding the status of the Alaska minke whale stock has to do with the uncertainty pertaining to the stock structure of this species in the eastern North Pacific. Because minke whales are considered common in the waters off Alaska and because the number of human-related removals is currently thought to be minimal, this stock is not considered a strategic stock. Reliable estimates of the minimum population size, population trends, PBR, and status of the stock relative to OSP are currently not available.

Sperm Whale (*Physeter macrocephalus*)

Sperm whales are widely distributed across the entire North Pacific and into the southern Bering Sea in summer but the majority is thought to be south of 40°N in winter (Rice 1974, 1989; Gosho et al. 1984; Miyashita et al. 1995). For management, the International Whaling Commission (IWC) had divided the North Pacific into two management regions (Donovan 1991) defined by a zig-zag line which starts at 150°W at the equator, is 160°W between 40-50°N, and ends up at 180°W north of 50°N; however, the IWC has not reviewed this stock boundary in many years (Donovan 1991). Sperm whales are formally listed as "endangered" under the Endangered Species Act (ESA), and consequently the Hawaiian stock is automatically considered as a "depleted" and "strategic" stock under the MMPA.

The only estimate of the status of North Pacific sperm whales in relation to carrying capacity (Gosho et al. 1984) is based on a CPUE method, which is no longer accepted as valid. Whaling removed at least 436,000 sperm whales from the North Pacific between 1800 and the end of commercial whaling for this species in 1987 (Best 1976; Ohsumi 1980; Brownell 1998; Kasuya 1998. There has been a prohibition on taking sperm whales in the North Pacific since 1988, but large-scale pelagic whaling stopped earlier, in 1980. As a result of this whaling, sperm whales are formally listed as "endangered" under the Endangered Species Act (ESA), and consequently

the California to Washington stock is automatically considered as a "depleted" and "strategic" stock under the MMPA.

California, Oregon, Washington Sperm whales are found year round in California waters (Dohl et al. 1983; Barlow 1995; Forney et al. 1995), but they reach peak abundance from April through mid-June and from the end of August through mid-November (Rice 1974). They were seen in every season except winter (Dec.-Feb.) in Washington and Oregon (Green et al. 1992). A recent survey designed specifically to investigate stock structure and abundance of sperm whales in the northeastern temperate Pacific revealed no apparent hiatus in distribution between the U.S. EEZ off California and areas farther west, out to Hawaii (Barlow and Taylor 2005). Recent analyses of genetic relationships of animals in the eastern Pacific found that mtDNA and microsatellite DNA of animals sampled in the California Current is significantly different from animals sampled further offshore and that genetic differences appeared larger in an east-west direction than in a north-south direction (Mesnick et al. 1999).

Barlow and Taylor (2001) estimated 1,407 (CV=0.39) sperm whales in California, Oregon, and Washington waters during summer/fall based on pooled 1993 and 1996 ship line transect surveys within 300 nmi of the coast and Barlow and Forney (2007) estimated 2,593 (CV= 0.30) sperm whales from a survey of the same area in 2001. A 2005 survey of this area resulted in an abundance estimate of 3,140 (CV=0.40) whales, which is corrected for diving animals not seen during surveys (Forney 2007). The most recent estimate of abundance for this stock is the geometric mean of the 2001 and 2005 summer/autumn ship survey estimates, or 2,853 (CV=0.25) sperm whales. A combined visual and acoustic line-transect survey conducted in the eastern temperate North Pacific in spring 1997 resulted in estimates of 26,300 (CV=0.81) sperm whales based on visual sightings, and 32,100 (CV=0.36) based acoustic detections and visual group size estimates (Barlow and Taylor 2005). Barlow and Taylor (2001) also estimated 1,640 (CV=0.33) sperm whales off the west coast of Baja California, but again there is no evidence for interchange between these animals and those off California, Oregon and Washington.

There is limited evidence of sperm whale movement from California to northern areas off British Columbia, but there are no abundance estimates for this area. The most precise and recent estimate of sperm whale abundance for this stock is therefore 2,853 (CV=0.25) animals from the ship surveys conducted in 2001 (Barlow and Forney 2007) and 2005 (Forney 2007). This estimate is corrected for diving animals not seen during surveys.

Hawai`i The Hawaiian Islands marked the center of a major nineteenth

century whaling ground for sperm whales (Gilmore 1959; Townsend 1935). Since 1936, at least 18 strandings have been reported from Oahu, Kauai and Kure Atoll (Woodward 1972; Nitta 1991; Maldini 2005). Sperm whales have also been sighted around several of the Northwestern Hawaiian Islands (Rice 1960; Barlow 2003), off the main island of Hawaii (Lee 1993; Mobley et al. 2000) in the Kauai Channel and in the Alenuihaha Channel between Maui and the island of Hawaii (Shallenberger 1981). In addition, the sounds of sperm whales have been recorded throughout the year off Oahu (Thompson and Friedl 1982). A summer/fall 2002 shipboard survey of waters within the U.S. Exclusive Economic Zone (EEZ) of the Hawaiian Islands resulted in 43 sperm whale sightings throughout the study area (Barlow 2003).

A spring 1997 combined visual and acoustic line-transect survey conducted in the eastern temperate North Pacific resulted in estimates of 24,000 (CV=0.46) sperm whales based on visual sightings, and 39,200 (CV=0.60) based on acoustic detections and visual group size estimates (Barlow and Taylor 1998). In the eastern tropical Pacific, the abundance of sperm whales has been estimated as 22,700 (95% C.I.=14,800-34,600; Wade and Gerrodette 1993). However, it is not known whether any or all of these animals routinely enter the U.S. EEZ of the Hawaiian Islands. As part of the Marine Mammal Research Program of the Acoustic Thermometry of Ocean Climate (ATOC) study, a total of twelve aerial surveys were conducted within about 25 nmi of the main Hawaiian Islands in 1993, 1995 and 1998. An average abundance estimate of 66 (CV=0.56) sperm whales was calculated from the combined survey data (Mobley et al. 2000). This study underestimated the total number of sperm whales within the U.S. EEZ off Hawaii, because areas around the Northwestern Hawaiian Islands (NWHI) and beyond 25 nautical miles from the main islands were not surveyed. Furthermore, this species is known to spend a large proportion of time diving, causing additional downward bias in the abundance estimate. The data on which this estimate was based are now over 5 years old. A 2002 shipboard line-transect survey of the entire Hawaiian Islands EEZ resulted in an abundance estimate of 7,082 (CV=0.30) sperm whales (Barlow 2003), including a correction factor for missed diving animals. This is currently the best available abundance estimate for this stock. The status of sperm whales in Hawaiian waters relative to OSP is unknown, and there are insufficient data to evaluate trends in abundance.

Alaska In the North Pacific, sperm whales are distributed widely, with the northernmost boundary extending from Cape Navarin (62EN) to the Pribilof Islands (Omura 1955). Sightings surveys conducted by NMML in the summer months between 2001 and 2006 have found sperm whales to be the most frequently sighted large cetacean in the coastal waters around the central and western Aleutian Islands (NMML unpublished data). Acoustic surveys

detected the presence of sperm whales year-round in the Gulf of Alaska although they appear to be more common in summer than in winter (Mellinger et al. 2004). These seasonal detections are consistent with the hypothesis that sperm whales migrate to higher latitudes in summer and migrate to lower latitudes in winter (Whitehead and Arnbom 1987).

Current and historic estimates for the abundance of sperm whales in the North Pacific are considered unreliable. Therefore, caution should be exercised in interpreting published estimates of abundance. The abundance of sperm whales in the North Pacific was reported to be 1,260,000 prior to exploitation, which by the late 1970s was estimated to have been reduced to 930,000 whales (Rice 1989). Although Kato and Miyashita (1998) believe their estimate to be upwardly biased, their preliminary analysis indicates 102,112 (CV = 0.155) sperm whales in the western North Pacific. The number of sperm whales of the North Pacific occurring within Alaska waters is unknown.

Sperm whales are listed as "endangered" under the Endangered Species Act of 1973, and therefore designated as "depleted" under the MMPA. As a result, this stock is classified as a strategic stock. However, on the basis of total abundance, current distribution, and regulatory measures that are currently in place, it is unlikely that this stock is in danger of extinction (Braham 1992). Reliable estimates of the minimum population, population trends, PBR, and status of the stock relative to its Optimum Sustainable Population size are currently not available, although the estimated annual rate of human-caused mortality and serious injury seems minimal for this stock.

Killer Whale (*Orcinus orca*)

Killer whales have been observed in all oceans and seas of the world (Leatherwood and Dahlheim 1978). Although reported from tropical and offshore waters, killer whales prefer the colder waters of both hemispheres, with greatest abundances found within 800 km of major continents (Mitchell 1975).

California, Oregon, Washington Along the west coast of North America, killer whales occur along the entire Alaskan coast (Braham and Dahlheim 1982), in British Columbia and Washington inland waterways (Bigg et al. 1990), and along the outer coasts of Washington, Oregon, and California (Green et al. 1992; Barlow 1995, 1997; Forney et al. 1995). Studies on mtDNA restriction patterns provide evidence that the 'resident' and 'transient' types are genetically distinct (Stevens et al. 1989, Hoelzel 1991, Hoelzel and Dover 1991, Hoelzel et al. 1998). Analysis of 73 samples

collected from eastern North Pacific killer whales from California to Alaska has demonstrated significant genetic differences among 'transient' whales from California through Alaska, 'resident' whales from the inland waters of Washington, and 'resident' whales ranging from British Columbia to the Aleutian Islands and Bering Sea (Hoelzel et al. 1998).

Offshore killer whales have more recently also been identified off the coasts of California, Oregon, and rarely, in Southeast Alaska (Ford et al. 1994, Black et al. 1997, Dahlheim et al. 1997). They apparently do not mix with the transient and resident killer whale stocks found in these regions (Ford et al. 1994, Black et al. 1997). Studies indicate the 'offshore' type, although distinct from the other types ('resident' and 'transient'), appears to be more closely related genetically, morphologically, behaviorally, and vocally to the 'resident' type killer whales (Black et al. 1997, Hoelzel et al. 1998; J. Ford, pers. comm.; L. Barrett-Lennard, pers. comm.). Based on data regarding association patterns, acoustics, movements, genetic differences, and potential fishery interactions, five killer whale stocks are recognized within the Pacific U.S. EEZ 1) the Eastern North Pacific Northern Resident stock - occurring from British Columbia through Alaska, 2) the Eastern North Pacific Southern Resident stock - occurring within the inland waters of Washington and southern British Columbia, 3) the Eastern North Pacific Transient stock – occurring from Alaska through California, 4) the Eastern North Pacific Offshore stock - occurring from Southeast Alaska through California (this report), and 5) the Hawaiian stock.

Off British Columbia, approximately 200 offshore killer whales were identified between 1989 and 1993 (Ford et al. 1994), and 20 of these individuals have also been seen off California (Black et al. 1997). Based on summer/fall shipboard linetransect surveys in 2001 (Barlow and Forney 2007) and 2005 (Forney 2007), the total number of killer whales within 300 nmi of the coasts of California, Oregon and Washington is estimated to be 1,014 animals (CV= 0.29). There is currently no way to reliably distinguish the different stocks of killer whales from sightings at sea, but photographs of individual animals can provide a rough estimate of the proportion of whales in each stock. A total of 161 individual killer whales photographed off California and Oregon have been determined to belong to the transient (105 whales) and offshore (56 whales) stocks (Black et al. 1997). Using these proportions to prorate the line transect abundance estimate yields an estimate of 56/161 * 1,014 = 353 offshore killer whales along the U.S. west coast. This is expected to be a conservative estimate of the number of offshore killer whales, because offshore whales apparently are less frequently seen near the coast (Black et al. 1997), and therefore photographic sampling may be biased towards transient whales. For stock assessment purposes, this combined value is currently the best available

estimate of abundance for offshore killer whales off the coasts of California, Oregon and Washington.

The total number of known offshore killer whales along the U.S. West coast, Canada and Alaska is 211 animals, but it is not known what proportion of time this transboundary stock spends in U.S. waters, and therefore this number is difficult to work with for PBR calculations. A minimum abundance estimate for all killer whales along the coasts of California, Oregon and Washington can be estimated from the 2001-2005 line-transect surveys as the 20th percentile of the mean 2001-2005 abundance estimate, or 798 killer whales. Using the same prorating as above, a minimum of 56/161 * 798 = 278 offshore killer whales are estimated to be in U.S. waters off California, Oregon and Washington. The status of killer whales in California in relation to OSP is unknown, and there are insufficient data to evaluate trends in abundance. They are not listed as "threatened" or "endangered" under the Endangered Species Act nor as "depleted" under the MMPA. There has been no documented human-caused mortality of this stock, and therefore they are not classified as a "strategic" stock under the MMPA.

The Eastern North Pacific Southern Resident stock is a trans-boundary stock including killer whales in inland Washington and southern British Columbia waters. Photo-identification of individual whales through the years has resulted in a substantial understanding of this stock's structure, behaviors, and movements. In 1993, the three pods comprising this stock totaled 96 killer whales (Ford et al. 1994). The population increased to 99 whales in 1995, then declined to 79 whales in 2001, and most recently numbered 86 whales in 2007. (Ford et al. 2000; Center for Whale Research, unpubl. data). The 2001-2005 counts included a whale born in 1999 (L-98) that was listed as missing during the annual census in May and June 2001 but was subsequently discovered alone in an inlet off the west coast of Vancouver Island (J. Ford, pers. comm.). L-98 remained separate from L pod until 10 March 2006 when he died due to injuries associated with a vessel interaction in Nootka Sound. L-98 has been subtracted from the official 2006 and subsequent population censuses. In addition, two calves that have been observed during the fall 2007 surveys will not be confirmed as members of the population until the official census is completed in May/June 2008 (Center for Whale Research, unpubl. data).

On November 15, 2005 NMFS listed Southern Resident killer whales as endangered under the ESA. Total annual fishery mortality and serious injury for this stock (0) is not known to exceed 10% of the calculated PBR (0.17) and, therefore, appears to be insignificant and approaching zero mortality and serious injury rate. The estimated annual level of human-caused mortality and serious injury of 0.2 animals per year exceeds the PBR (0.17).

Southern Resident killer whales are formally listed as "endangered" under the ESA and consequently the stock is automatically considered as a "depleted" and "strategic" stock under the MMPA.

Hawai`i Killer whales are rarely observed in Hawaiian waters. One stranding from the island of Hawaii was reported in 1950 (Richards 1952). Two sightings have been reported, one in January 1978 off the Waianae Coast of Oahu and another in December 1979 near Kauai (Shallenberger 1981).

The population of killer whales in the eastern tropical Pacific has been estimated from shipboard sightings surveys (Wade and Gerrodette 1993). As part of the Marine Mammal Research Program of the Acoustic Thermometry of Ocean Climate (ATOC) study, a total of twelve aerial surveys were conducted within about 25 nmi of the main Hawaiian Islands in 1993, 1995 and 1998 (Mobley et al. 2000), but no sightings of killer whales were made. In further surveys conducted in 2000, a single pod of four killer whales was sighted (Mobley et al., 2001a). A 2002 shipboard line-transect survey of the entire Hawaiian Islands EEZ resulted in an abundance estimate of 430 (CV=0.72) killer whales (Barlow 2003). A group of 4 killer whales were sighted off of the Kona coast of Hawaii in May, 2003 (Baird, pers. comm.). This is currently the best available abundance estimate for this stock. The status of killer whales in Hawaiian waters relative to OSP is unknown, and there are insufficient data to evaluate trends in abundance. No habitat issues are known to be of concern for this species.

Alaska Based on data regarding association patterns, acoustics, movements, and genetic differences, eight killer whale stocks are now recognized within the Pacific U.S. EEZ: 1) the Alaska Resident stock - occurring from southeastern Alaska to the Aleutian Islands and Bering Sea, 2) the Northern Resident stock - occurring from British Columbia through part of southeastern Alaska, 3) the Southern Resident stock - occurring mainly within the inland waters of Washington State and southern British Columbia, but also in coastal waters from British Columbia through California, 4) the Gulf of Alaska, Aleutian Islands, and Bering Sea Transient stock - occurring mainly from Prince William Sound through the Aleutian Islands and Bering Sea (see Fig. 22), 5) the AT1 transient stock - occurring in Alaska from Prince William Sound through the Kenai Fjords, 6) the West Coast transient stock - occurring from California through southeastern Alaska, 7) the Offshore stock - occurring from California through Alaska, and 8) the Hawaiian stock. 'Transient' whales in Canadian waters are considered part of the West Coast Transient stock.

The survey technique utilized for obtaining the abundance estimate of killer

whales is a direct count of individually identifiable animals. Other estimates of the overall population size (i.e., NBEST) and associated CV(N) are not currently available. Because this population has been studied for such a long time period, each individual is well documented and, except for births, no new individuals are expected to be discovered. Therefore, the estimated population size of 216 animals can also serve as a minimum count of the population. Thus, the minimum population estimate (NMIN) for the Northern Resident stock of killer whales is 216 animals, which includes animals found in Canadian waters (see PBR Guidelines regarding the status of migratory transboundary stocks, Wade and Angliss 1997). Information on the percentage of time animals typically encountered in Canadian waters spend in U. S. waters is unknown. This approach is consistent with the recommendations of the Alaska Scientific Review Group (DeMaster 1996). The Northern Resident killer whale stock is not listed as "depleted" under the MMPA or listed as "threatened" or "endangered" under the Endangered Species Act.

Short-finned Pilot Whale (*Globicephala macrorhynchus*)
Short-finned pilot whales are found in all oceans, primarily in tropical and warm-temperate waters.

California, Oregon, Washington Although the full geographic range of the California, Oregon, and Washington population is not known, it may be continuous with animals found off Baja California, and its individuals are morphologically distinct from short-finned pilot whales found farther south in the eastern tropical Pacific (Polisini 1981). Separate southern and northern forms of short-finned pilot whales have also been documented for the western North Pacific (Kasuya et al. 1988; Wada 1988; Miyazaki and Amano 1994). For the Marine Mammal Protection Act (MMPA) stock assessment reports, short-finned pilot whales within the Pacific U.S. Exclusive Economic Zone are divided into two discrete, non-contiguous areas: 1) waters off California, Oregon and Washington (this report), and 2) Hawaiian waters.

Only one group of pilot whales (numbering approximately 7 animals) was seen during the two most recent ship surveys conducted off California, Oregon, and Washington in 2001 and 2005 (Barlow and Forney 2007; Forney 2007). All animals were seen during the 2005 survey. The abundance of short-finned pilot whales in this region appears to be variable and influenced by prevailing oceanographic conditions (Forney 1997, Forney and Barlow 1998). Because animals may spend time outside the U.S. Exclusive Economic Zone as oceanographic conditions change, a multi-year average abundance estimate is the most appropriate for management within U.S. waters. The 2001-2005 un-weighted average abundance estimate for

California, Oregon and Washington waters based on the two ship surveys is 245 (CV=0.97) short-finned pilot whales (Barlow and Forney 2007; Forney 2007).

The status of short-finned pilot whales off California, Oregon and Washington in relation to OSP is unknown. They have declined in abundance in the Southern California Bight, likely a result of a change in their distribution since the 1982-83 El Niño, but the nature of these changes and potential habitat issues are not adequately understood. Short-finned pilot whales are not listed as "threatened" or "endangered" under the Endangered Species Act nor as "depleted" under the MMPA.

Hawai`i Short-finned pilot whales are found in all oceans, primarily in tropical and warm-temperate waters. They are commonly observed around the main Hawaiian Islands and are also present around the Northwestern Hawaiian Islands (Shallenberger 1981; Barlow 2006). During a 2002 shipboard survey of waters within the U.S. Exclusive Economic Zone (EEZ) of the Hawaiian Islands, 25 sightings of short-finned pilot whales were made (Barlow 2006). Fourteen strandings of short-finned pilot whales have been documented from the main Hawaiian Islands, including five mass strandings (Tomich 1986; Nitta 1991; Maldini 2003). Genetic analyses of tissue samples collected near the main Hawaiian Islands indicate that Hawaiian short-finned pilot whales are reproductively isolated from short-finned pilot whales found in the eastern Pacific Ocean (S. Chivers, NMFS/SWFSC, unpublished data); however, the offshore range of this Hawaiian population is unknown.

Estimates of short-finned pilot whale populations have been made off Japan (Miyashita 1993) and in the eastern tropical Pacific (Wade and Gerrodette 1993), but it is not known whether any of these animals are part of the same population that occurs around the Hawaiian Islands. As part of the Marine Mammal Research Program of the Acoustic Thermometry of Ocean Climate (ATOC) study, a total of twelve aerial surveys were conducted within about 25 nmi of the main Hawaiian Islands in 1993, 1995 and 1998. An abundance estimate of 1,708 (CV=0.32) short-finned pilot whales was calculated from the combined survey data (Mobley et al. 2000). This study underestimated the total number of short-finned pilot whales within the U.S. EEZ off Hawaii, because areas around the Northwestern Hawaiian Islands (NWHI) and beyond 25 nautical miles from the main islands were not surveyed. Furthermore, the data on which this estimate was based are now over 5 years old. A 2002 shipboard line-transect survey of the entire Hawaiian Islands EEZ resulted in an abundance estimate of 8,846 (CV=0.49) short-finned pilot whales (Barlow 2006). This is currently the best available abundance estimate for short-finned pilot whales within the Hawaiian Islands

EEZ. No abundance estimates are currently available for short-finned pilot whales in U.S. EEZ waters of Palmyra Atoll; however, density estimates for short-finned pilot whales in other Pacific regions can provide a range of likely abundance estimates in this unsurveyed region. Published estimates of short-finned pilot whale density (animals per km2) in the Pacific are: 0.0040 (CV=0.38) for the U.S. EEZ of the Hawaiian Islands (Barlow 2006); 0.0237 (CV=0.32) for nearshore waters surrounding the main Hawaiian Islands (Mobley et al. 2000), 0.0084 (CV=0.14) and 0.0040 (CV=0.23) for the eastern tropical Pacific Ocean (Wade and Gerrodette 1993; Ferguson and Barlow 2003), and 0.0025 (CV=0.29) for the eastern tropical Pacific Ocean west of 120°W and north of 5°N (Ferguson and Barlow 2003). Applying the lowest and highest of these density estimates to U.S. EEZ waters surrounding Palmyra Atoll (area size = 352,821 km2) yields a range of plausible abundance estimates of 891-8,362 short-finned pilot whales. Similarly, there are no abundance estimates for short-finned pilot whales in U.S. EEZ waters of Johnston Atoll. Applying the lowest and highest of the above density estimates to U.S. EEZ waters surrounding Johnston Atoll (area size = 443,586 km2) yields a range of plausible abundance estimates of 1,121- 10,513 short-finned pilot whales.

The status of short-finned pilot whales in Hawaiian waters relative to OSP is unknown, and there are insufficient data to evaluate trends in abundance. No habitat issues are known to be of concern for this species. They are not listed as "threatened" or "endangered" under the Endangered Species Act (1973), nor as "depleted" under the MMPA.

Melon-headed Whale (*Peponocephala electra*)

Melon-headed whales are found in tropical and warm-temperate waters throughout the world. The distribution of reported sightings suggests that the oceanic habitat of this species is primarily equatorial waters (Perryman et al. 1994). Large herds are seen regularly in Hawaiian waters, especially off the Waianae coast of Oahu, the north Kohala coast of Hawaii, and the leeward coast of Lanai (Shallenberger 1981). A comprehensive shipboard survey of the Hawaiian Exclusive Economic Zone (EEZ), resulted in only one sighting of melon-headed whales (Barlow 2003). Inter-island movements from Kauai to Hawaii have been documented and genetic samples from at least 82 animals are available for future stock structure analyses (R.W. Baird, pers. comm.). Little is known about this species elsewhere in its range, and most knowledge about its biology comes from mass strandings (Perryman et al. 1994). Fourteen strandings are known from Hawaii (Nishiwaki and Norris 1966; Shallenberger 1981; Nitta 1991; Maldini 2005). For the Marine Mammal Protection Act (MMPA) stock assessment reports, there is a single Pacific management stock including only animals found

within the U.S. EEZ of the Hawaiian Islands.

An abundance estimate of melon-headed whales is available for the eastern tropical Pacific (Wade and Gerrodette 1993), but it is not known whether any of these animals are part of the same population that occurs around the Hawaiian Islands. As part of the Marine Mammal Research Program of the Acoustic Thermometry of Ocean Climate (ATOC) study, a total of twelve aerial surveys were conducted within about 25 nmi of the main Hawaiian Islands in 1993, 1995 and 1998. An abundance estimate of 154 (CV=0.88) melon-headed whales was calculated from the combined survey data (Mobley et al. 2000). This study underestimated the total number of melon-headed whales within the U.S. EEZ off Hawaii, because areas around the Northwestern Hawaiian Islands (NWHI) and beyond 25 nautical miles from the main islands were not surveyed. Furthermore, the data on which this estimate was based are now over 5 years old. A 2002 shipboard line-transect survey of the entire Hawaiian Islands EEZ resulted in an abundance estimate of 2,947 (CV=1.11) melon-headed whales (Barlow 2003). This is currently the best available abundance estimate for this stock.

The status of melon-headed whales in Hawaiian waters relative to OSP is unknown, and there are insufficient data to evaluate trends in abundance. No habitat issues are known to be of concern for this species. They are not listed as "threatened" or "endangered" under the Endangered Species Act (1973), nor as "depleted" under the MMPA.

False Killer Whale (*Pseudorca crassidens*)

False killer whales are found worldwide mainly in tropical and warm-temperate waters (Stacey et al. 1994). In the North Pacific, this species is well known from southern Japan, Hawaii, and the eastern tropical Pacific. There are six stranding records from Hawaiian waters (Nitta 1991; Maldini 2005). One on-effort sighting of false killer whales was made during a 2002 shipboard survey of waters within the U.S. Exclusive Economic Zone (EEZ) of the Hawaiian Islands (Barlow 2006). Smaller-scale surveys conducted around the Main Hawaiian Islands show that false killer whales are also commonly encountered in nearshore waters (Baird et al. 2005, Mobley et al. 2000, Mobley 2001, 2002, 2003, 2004).

Four false killer whale samples, two collected outside the Hawaiian EEZ and two collected more than 100 nautical miles from the main Hawaiian Islands were determined to have ENP-like haplotypes. This indicates that false killer whales within the Hawaiian EEZ belong to two different genetic populations, with a boundary somewhere within the Hawaiian EEZ. Based on sighting locations and genetic analyses of tissue samples (Chivers et al. 2008), this

stock assessment report applies a stock boundary corresponding to the 25-75 nmi longline exclusion zone around the main Hawaiian Islands, to recognize the insular false killer whale population as a separate stock for management. This boundary may be revised in the future as additional information becomes available. For the Marine Mammal Protection Act (MMPA) stock assessment reports, there are currently three Pacific Islands Region management stocks (Chivers et al. 2008): 1) the Hawaii Insular Stock, which includes animals inhabiting waters within the 25-75 nmi longline exclusion zone around the main Hawaiian Islands, and 2) the Hawaii Pelagic Stock, which includes false killer whales inhabiting the waters of the U.S. EEZ of Hawaii outside of the 25-75 nmi longline exclusion zone around the main Hawaiian Islands and 3) the Palmyra Stock, which includes false killer whales found within the U.S. EEZ of Palmyra Atoll.

Hawai`i Insular Stock A recent mark- recapture study of photo-identification data obtained during 2000-2004 around the main Hawaiian Islands produced an estimate of 123 (CV=0.72) false killer whales (Baird et al. 2005). This updates an estimate of 121 (CV=0.47) made by Mobley et al. (2000) based on 1994-1998 aerial surveys. Both estimates apply only to Hawaii Insular Stock because surveys were conducted within 75 nmi of the Main Hawaiian Islands. The minimum population estimate for the Hawaii Insular stock false killer whales is the number of distinct individuals identified in this population during the 2002-2004 photo-identification studies, 76 individuals (Baird et al. 2005). This is similar to the log-normal 20th percentile of the mark-recapture abundance estimate, 71 false killer whales. The status of false killer whales in insular Hawaiian waters (within 75 nmi) relative to OSP is unknown, and there are insufficient data to evaluate trends in abundance. They are not listed as "threatened" or "endangered" under the Endangered Species Act (1973), nor as "depleted" under the MMPA.

Hawai`i Pelagic Stock Analyses of a 2002 shipboard line-transect survey of the Hawaiian Islands EEZ (HICEAS survey) resulted an abundance estimate of 236 (CV=1.13) false killer whales (Barlow 2006) outside of 75 nmi of the Main Hawaiian Islands. A recent re-analysis of the HICEAS data using improved methods and incorporating additional sighting information obtained on line-transect surveys south of the Hawaiian EEZ during 2005, resulted in a revised estimate of 484 (CV = 0.93) false killer whales within the Hawaiian Islands EEZ outside of 75 nmi of the Main Hawaiian Islands (Barlow & Rankin 2007). This is the best available abundance estimate for the Hawaii Pelagic Stock of false killer whales. The status of the Hawaii Pelagic Stock of false killer whale relative to OSP is unknown, and there are insufficient data to evaluate trends in abundance. No habitat issues are known to be of concern for this species. They are not listed as "threatened"

or "endangered" under the Endangered Species Act (1973), nor as "depleted" under the MMPA.

Palmyra Stock Recent line transect surveys in the U.S. EEZ waters of Palmyra Atoll produced an estimate of 1,329 (CV = 0.6 5) false killer whales (Barlow & Rankin 2007). This is the best available abundance estimate for false killer whales within the Palmyra Atoll EEZ. The status of false killer whales in Palmyra Atoll EEZ waters relative to OSP is unknown, and there are insufficient data to evaluate trends in abundance. No habitat issues are known to be of concern for this species. They are not listed as "threatened" or "endangered" under the Endangered Species Act (1973), nor as "depleted" under the MMPA.

Pygmy Killer Whale (*Feresa attenuata*)

Pygmy killer whales are found in tropical and subtropical waters throughout the world (Ross and Leatherwood 1994). Most knowledge of this species is from stranded or live-captured specimens. Pryor et al. (1965) stated that pygmy killer whales have been observed several times off the lee shore of Oahu, and that "they seem to be regular residents of the Hawaiian area." Although all sightings up to that time had been off Oahu and the Big Island, Shallenberger (1981) stated that this species might be found elsewhere in Hawaii, as well. No pygmy killer whales were seen during 1993-98 aerial surveys within about 25 nmi of the main Hawaiian Islands (Mobley et al. 2000). Three sightings of pygmy killer whales were made during a 2002 shipboard survey of U.S. Exclusive Economic Zone (EEZ) waters surrounding the Hawaiian Islands (Barlow 2003). Six strandings have been documented from Maui and the island of Hawaii (Nitta 1991, Maldini 2005). For the Marine Mammal Protection Act (MMPA) stock assessment reports, there is a single Pacific management stock including only animals found within the U.S. EEZ of the Hawaiian Islands. A population estimate has been made for this species in the eastern tropical Pacific (Wade and Gerrodette 1993), but it is not known whether any of these animals are part of the same population that occurs around the Hawaiian Islands. As part of the Marine Mammal Research Program of the Acoustic Thermometry of Ocean Climate (ATOC) study, a total of twelve aerial surveys were conducted within about 25 nmi of the main Hawaiian Islands in 1993, 1995 and 1998 (Mobley et al. 2000), but there were no sightings of pygmy killer whales. A 2002 shipboard line-transect survey of the entire Hawaiian Islands EEZ resulted in an abundance estimate of 817 (CV=1.12) pygmy killer whales (Barlow 2003). This is currently the best available abundance estimate for this stock. The log-normal 20th percentile of the 2002 abundance estimate is 382 pygmy killer whales.

The status of pygmy killer whales in Hawaiian waters relative to OSP is unknown, and there are insufficient data to evaluate trends in abundance. No habitat issues are known to be of concern for this species. This species is not listed as "threatened" or "endangered" under the Endangered Species Act (1973), nor as "depleted" under the MMPA.

Dwarf Sperm Whale (*Kogia sima*)

Dwarf sperm whales are distributed throughout deep waters and along the continental slopes of the North Pacific and other ocean basins (Caldwell and Caldwell 1989; Ross 1984). This species was only recognized as being distinct from the pygmy sperm whale in 1966 (Handley, 1966), and early records for the two species are confounded. Along the U.S. west coast, no at-sea sightings of this species have been reported; however, this may be partially a reflection of their pelagic distribution, small body size and cryptic behavior. For the Marine Mammal Protection Act (MMPA) stock assessment reports, dwarf sperm whales within the Pacific U.S. Exclusive Economic Zone are divided into two discrete, non-contiguous areas: 1) waters off California, Oregon and Washington (this report), and 2) Hawaiian waters. No information is available to estimate the population size of dwarf sperm whales off the U.S. west coast, as no sightings of this species have been documented despite numerous vessel surveys of this region (Barlow 1995; Barlow and Gerrodette 1996; Barlow and Forney 2007; Forney 2007). Based on previous sighting surveys and historical stranding data, it is likely that recent ship survey sightings were of pygmy sperm whales; *K. breviceps*. No information is available to obtain a minimum population estimate for dwarf sperm whales.

California, Oregon, Washington The status of dwarf sperm whales in California, Oregon and Washington waters relative to OSP is not known, and there are insufficient data to evaluate potential trends in abundance. No habitat issues are known to be of concern for this species, but in recent years questions have been raised regarding potential effects of human-made sounds on deep-diving cetacean species, such as dwarf sperm whales (Richardson et al. 1995). In particular, active sonar has been implicated in the mass stranding of beaked whales in the Mediterranean Sea (Frantzis 1998) and more recently in the Caribbean (U.S. Dept. of Commerce and Secretary of the Navy 2001). They are not listed as "threatened" or "endangered" under the Endangered Species Act nor as "depleted" under the MMPA.

Hawai`i At least four strandings of dwarf sperm whales have been documented in Hawaii (Tomich 1986; Nitta 1991; Maldini 2005). Two sightings of pygmy or dwarf sperm whales were made between Hawaii and

Maui during 1993-98 aerial surveys within about 25 nmi of the main Hawaiian Islands (Mobley et al. 2000). Five sightings of dwarf sperm whale were made during a 2002 shipboard survey of waters within the U.S. Exclusive Economic Zone (EEZ) of the Hawaiian Islands (Barlow 2003). For the Marine Mammal Protection Act (MMPA) stock assessment reports, dwarf sperm whales within the Pacific U.S. EEZ are divided into two discrete, non-contiguous areas: 1) Hawaiian waters (this report), and 2) waters off California, Oregon and Washington.

As part of the Marine Mammal Research Program of the Acoustic Thermometry of Ocean Climate (ATOC) study, a total of twelve aerial surveys were conducted within about 25 nmi of the main Hawaiian Islands in 1993, 1995 and 1998. Two sightings of five pygmy or dwarf sperm whales were made; however these sightings were excluded during abundance analyses (Mobley et al. 2000), because they were made during poor observation conditions. Therefore, no abundance was estimated from these surveys for dwarf sperm whales within Hawaiian waters. Baird (2005) reports that dwarf sperm whales are the sixth most commonly sighted odontocete around the Main Hawaiian Islands. This species' small size, tendency to avoid vessels, deep-diving habits, combined with the high proportion of Kogia sightings that are not identified to species, may result in negatively biased relative abundances in this region (R.W. Baird, pers. comm.). A 2002 shipboard line-transect survey of the entire Hawaiian Islands EEZ resulted in an abundance estimate of 19,172 (CV=0.66) dwarf sperm whales (Barlow 2003), including a correction factor for missed diving animals. This is currently the best available abundance estimate for this stock. The log-normal 20th percentile of the 2002 abundance estimate is 11,555 dwarf sperm whales.

The status of dwarf sperm whales in Hawaiian waters relative to OSP is unknown, and there are insufficient data to evaluate trends in abundance. They are not listed as "threatened" or "endangered" under the Endangered Species Act (1973), nor as "depleted" under the MMPA.

Pygmy Sperm Whale (*Kogia breviceps*)

Pygmy sperm whales are found throughout the world in tropical and warm-temperate waters (Caldwell and Caldwell 1989). For the Marine Mammal Protection Act (MMPA) stock assessment reports, pygmy sperm whales within the Pacific U.S. EEZ are divided into two discrete, non-contiguous areas: 1) Hawaiian waters (this report), and 2) waters off California, Oregon and Washington.

California, Oregon, Washington Along the U.S. west coast, sightings of this

species and of animals identified only as *Kogia* sp. have been very rare. However, this probably reflects their pelagic distribution, small body size and cryptic behavior, rather than a measure of rarity. Strandings of pygmy sperm whales in this region are known from California, Oregon and Washington (Roest 1970; Caldwell and Caldwell 1989; NMFS, Northwest Region, unpublished data; NMFS, Southwest Region, unpublished data), while strandings of dwarf sperm whales (*Kogia sima*) are rare in this region. At-sea sightings in this region have all been either of pygmy sperm whales or unidentified *Kogia* sp. Available data are insufficient to identify any seasonality in the distribution of pygmy sperm whales, or to delineate possible stock boundaries.

Although pygmy sperm whales have been sighted along the U.S. west coast on several line transect surveys utilizing both aerial and shipboard platforms, sightings have been too rare to produce reliable population estimates. The most recent abundance estimate of 899 (CV=1.00) animals was based on one sighting of an unidentified *Kogia* during a 1996 ship survey of California, Oregon, and Washington waters (Barlow and Forney 2007). Based on previous sighting surveys and historical stranding data, it is likely that these sightings were of pygmy sperm whales; *K. breviceps*. The 1996 estimate incorporates a correction factor for animals missed, based on a model of their diving behavior, detection distances, and the searching behavior of observers (Barlow 1999). About 35% of all trackline groups are estimated to be seen. Because no sightings of pygmy sperm whales have been recorded since 1996 and the most recent abundance estimates is >8 years old (Barlow and Forney 2007), there is no current estimate of abundance available. The lack of recent sightings likely reflects the cryptic nature of this species (they are detected almost exclusively in extremely calm sea conditions), rather than an absence of animals in the region.

The status of pygmy sperm whales in California, Oregon and Washington waters relative to OSP is not known, and there are insufficient data to evaluate potential trends in abundance. No habitat issues are known to be of concern for this species, but in recent years questions have been raised regarding potential effects of human-made sounds on deep-diving cetacean species, such as pygmy sperm whales (Richardson et al. 1995).

Hawai`i Between the years 1949 and 2002, at least 22 strandings of this species were reported in the Hawaiian Islands (Tomich 1986; Nitta 1991; Maldini 2005). A stranded calf was held for several days at Sea Life Park (Pryor 1975:94). Shallenberger (1981) reported three sightings off Oahu and Maui. Two sightings of pygmy or dwarf sperm whales were made between Hawaii and Maui during 1993-98 aerial surveys within about 25 nmi of the main Hawaiian Islands (Mobley et al. 2000). Two sightings were made

during a 2002 shipboard survey of waters within the U.S. Exclusive Economic Zone (EEZ) of the Hawaiian Islands (Barlow 2003). Baird (2005) reported one sighting off Ni'ihau and another off the island off Hawaii (R.W. Baird, pers. comm.). Nothing is known about stock structure for this species.

As part of the Marine Mammal Research Program of the Acoustic Thermometry of Ocean Climate (ATOC) study, a total of twelve aerial surveys were conducted within about 25 nmi of the main Hawaiian Islands in 1993, 1995 and 1998. Two sightings of five pygmy or dwarf sperm whales were made; however, these sightings were excluded during abundance analyses (Mobley et al. 2000), because they were made during poor observation conditions. A 2002 shipboard line-transect survey of the entire Hawaiian Islands EEZ resulted in an abundance estimate of 7,251 (CV=0.77) pygmy sperm whales (Barlow 2003), including a correction factor for missed diving animals. This is currently the best available abundance estimate for this stock. The log-normal 20th percentile of the 2002 abundance estimate is 4,082 pygmy sperm whales.

The status of pygmy sperm whales in Hawaiian waters relative to OSP is unknown, and there are insufficient data to evaluate trends in abundance. They are not listed as "threatened" or "endangered" under the Endangered Species Act (1973), nor as "depleted" under the MMPA.

Short-beaked Common Dolphin (*Delphinus delphis*)

Short-beaked common dolphins are the most abundant cetacean off California, and are widely distributed between the coast and at least 300 nmi distance from shore. The abundance of this species off California has been shown to change on both seasonal and inter-annual time scales (Dohl et al. 1986; Barlow 1995; Forney et al. 1995). Historically, they were reported primarily south of Pt. Conception (Dohl et al. 1986), but have been commonly sighted as far north as 42°N during 1991-2005 NMFS line-transect vessel surveys. Four strandings of common dolphins (*Delphinus sp*.) have been reported in Oregon and Washington since 1942 (B. Norberg, pers. comm.), but three of these could not be identified to species. Significant seasonal shifts in the abundance and distribution of common dolphins have been identified based on winter/spring 1991-92 and summer/fall 1991 surveys (Forney and Barlow 1998). Their distribution is continuous southward into Mexican waters to about 13°N (Perrin et al. 1985; Wade and Gerrodette 1993; Mangels and Gerrodette 1994), and short-beaked common dolphins off California may be an extension of the "northern common dolphin" stock defined for management of eastern tropical Pacific tuna fisheries (Perrin et al. 1985). However, preliminary data on variation in dorsal fin color patterns suggest there may be multiple stocks in this region,

including at least two possible stocks in California (Farley 1995). The less abundant long-beaked common dolphin has only recently been recognized as a different species (Heyning and Perrin 1994; Rosel et al. 1994), and much of the available information has not differentiated between the two types of common dolphin. Under the Marine Mammal Protection Act (MMPA), short-beaked common dolphins involved in tuna purse seine fisheries in international waters of the eastern tropical Pacific are managed separately, and they are not included in the assessment reports. For the MMPA stock assessment reports, there is a single Pacific management stock including only animals found within the U.S. Exclusive Economic Zone of California, Oregon and Washington. The log-normal 20th percentile of the 2001-2005 abundance estimate is 338,708 short-beaked common dolphins. The status of short-beaked common dolphins in Californian waters relative to OSP is not known. The observed increase in abundance of this species off California probably reflects a distributional shift (Anganuzzi et al. 1993; Barlow 1995; Forney et al. 1995; Forney and Barlow 1998), rather than an overall population increase due to growth. No habitat issues are known to be of concern for this species. They are not listed as "threatened" or "endangered" under the Endangered Species Act nor as "depleted" under the MMPA.

Long-beaked Common Dolphin (*Delphinus capensis*)

Long-beaked common dolphins have only recently been recognized as a distinct species (Heyning and Perrin 1994; Rosel et al. 1994). Along the U.S. west coast, their distribution overlaps with that of the short-beaked common dolphin, and much historical information has not distinguished between these two species. Long-beaked common dolphins are commonly found within about 50 nmi of the coast, from Baja California (including the Gulf of California) northward to about central California. Stranding data and sighting records indicate that the relative abundance of this species off California changes both seasonally and interannually. Under the Marine Mammal Protection Act (MMPA), long-beaked ("Baja neritic") common dolphins involved in eastern tropical Pacific tuna fisheries are managed separately as part of the 'northern common dolphin' stock (Perrin et al. 1985), and these animals are not included in the assessment reports. For the MMPA stock assessment reports, there is a single Pacific management stock including only animals found within the U.S. Exclusive Economic Zone of California. The most recent abundance estimates are 20,076 (CV=0.71) and 11,714 (CV=0.99) long beaked common dolphin, based on 2001 and 2005 ship line transect surveys, respectively, of California, Oregon, and Washington waters (Barlow and Forney 2007, Forney 2007). The 2001 estimate of 20,076 (CV=0.71) is based on a new multiple-covariate line transect analysis (Barlow and Forney 2007) and supercedes the estimate of 306 (CV=1.02) reported by Barlow (2003). See Appendix 2 for additional

information on abundance estimates used in this stock assessment. The distribution and abundance of long-beaked common dolphins off California appears to be variable on interannual and seasonal time scales (Heyning and Perrin 1994). As oceanographic conditions change, long-beaked common dolphins may move between Mexican and U.S. waters, and therefore a multi-year average abundance estimate is the most appropriate for management within the U.S. waters. The geometric mean abundance estimate for California, Oregon and Washington waters based on two ship surveys conducted in 2001 and 2005 is 15,335 (CV= 0.56) long-beaked common dolphins (Barlow and Forney 2007, Forney 2007). The log-normal 20th percentile of the weighted average abundance estimate is 9,880 long-beaked common dolphins. The status of long-beaked common dolphins in California waters relative to OSP is not known, and there are insufficient data to evaluate potential trends in abundance of this species of common dolphin. No habitat issues are known to be of concern for this species. They are not listed as "threatened" or "endangered" under the Endangered Species Act nor as "depleted" under the MMPA.

Pacific White-Sided Dolphin (*Lagenorhynchus obliquidens*)

Pacific white-sided dolphins are endemic to temperate waters of the North Pacific Ocean, and are common both on the high seas and along the continental margins. No habitat issues are known to be of concern for this species. They are not listed as "threatened" or "endangered" under the Endangered Species Act nor as "depleted" under the MMPA.

California, Oregon, Washington Off the U.S. west coast, Pacific white-sided dolphins have been seen primarily in shelf and slope waters. Sighting patterns from recent aerial and shipboard surveys conducted in California, Oregon and Washington (Green et al. 1992; 1993; Barlow 1995; Forney et al. 1995) suggest seasonal north-south movements, with animals found primarily off California during the colder water months and shifting northward into Oregon and Washington as water temperatures increase in late spring and summer (Green et al. 1992; Forney 1994). Stock structure throughout the North Pacific is poorly understood, but based on morphological evidence, two forms are known to occur off the California coast (Walker et al. 1986; Chivers et al. 1993). Specimens belonging to the northern form were collected from north of about 33°N, (Southern California to Alaska), and southern specimens were obtained from about 36°N southward along the coasts of California and Baja California. Samples of both forms have been collected in the Southern California Bight, but it is unclear whether this indicates sympatry in this region or whether they may occur there at different times (seasonally or inter-annually). Recent genetic analyses have confirmed the distinctness of animals found off Baja California

from animals occurring in U.S. waters north of Point Conception, California and in the high seas of the North Pacific (Lux et al. 1997). Based on these genetic data, an area of mixing between the two forms appears to be located off Southern California (Lux et al. 1997).

The most recent estimates of abundance for Pacific white-sided dolphins are based on two summer/autumn shipboard surveys conducted within 300 nmi of the coasts of California, Oregon, and Washington in 2001 and 2005 (Barlow and Forney 2007; Forney 2007). The distribution of Pacific white-sided dolphins throughout this region is highly variable, apparently in response to oceanographic changes on both seasonal and inter-annual time scales (Forney and Barlow 1998). As oceanographic conditions vary, Pacific white-sided dolphins may spend time outside the U.S. Exclusive Economic Zone, and therefore a multi-year average abundance estimate including California, Oregon and Washington is the most appropriate for management within U.S. waters. The 2001-2005 geometric mean abundance estimate for California, Oregon and Washington waters based on the two most recent ship surveys is 20,719 (CV = 0.22) Pacific white-sided dolphins (Barlow and Forney 2007; Forney 2007). The log-normal 20th percentile of the 2001-2005 average abundance estimate is 17,201 Pacific white-sided dolphins. The status of Pacific white-sided dolphins in California, Oregon and Washington relative to OSP is not known, and there is no indication of a trend in abundance for this stock.

Alaska The Pacific white-sided dolphin is found throughout the temperate North Pacific Ocean, north of the coasts of Japan and Baja California, Mexico. In the eastern North Pacific the species occurs from the southern Gulf of California, north to the Gulf of Alaska, west to Amchitka in the Aleutian Islands, and is rarely encountered in the southern Bering Sea. The species is common both on the high seas and along the continental margins, and animals are known to enter the inshore passes of Alaska, British Columbia, and Washington (Ferrero and Walker 1996).

The most complete population abundance estimate for Pacific white-sided dolphins was calculated from line transect analyses applied to the 1987-90 central North Pacific marine mammal sightings survey data (Buckland et al. 1993). The Buckland et al. (1993) abundance estimate, 931,000 (CV = 0.90) animals, more closely reflects a range-wide estimate rather than one that can be applied to either of the two management stocks off the west coast of North America. Furthermore, Buckland et al. (1993) suggested that Pacific white-sided dolphins show strong vessel attraction but that a correction factor was not available to apply to the estimate. While the Buckland et al. (1993) abundance estimate is not considered appropriate to apply to the management stock in Alaskan waters, the portion of the

estimate derived from sightings north of 45EN in the Gulf of Alaska can be used as the population estimate for this area (26,880). For comparison, Hobbs and Lerczak (1993) estimated 15,200 Pacific white-sided dolphins in the Gulf of Alaska based on a single sighting of 20 animals. Small cetacean aerial surveys in the Gulf of Alaska during 1997 sighted one group of 164 Pacific white-sided dolphins off Dixon entrance, while similar surveys in Bristol Bay in 1999 made 18 sightings of a school or parts thereof off Port Moller (R. Hobbs, NMFS-NMML, pers. comm.).

The minimum population estimate (NMIN) for this stock would be 26,880, based on the sum of abundance estimates for 4 separate 5E H 5E blocks north of 45EN (1,970+6,427+6,101+12,382 = 26,880) reported in Buckland et al. (1993). This is considered a minimum estimate because the abundance of animals in a fifth 5E H 5E block (53,885) which straddled the boundary of the two coastal management stocks were not included in the estimate for the North Pacific stock and because much of the potential habitat for this stock was not surveyed between 1987 - 1990. However, because the abundance estimate used in this calculation is more than 8 years old, the minimum population estimate for this stock is unknown.

Risso's Dolphin (*Grampus griseus*)

Risso's dolphins are distributed worldwide in tropical and warm-temperate waters. They are not listed as "threatened" or "endangered" under the Endangered Species Act nor as "depleted" under the MMPA. For the Marine Mammal Protection Act (MMPA) stock assessment reports, Risso's dolphins within the Pacific U.S. Exclusive Economic Zone are divided into two discrete, non-contiguous areas: 1) waters off California, Oregon and Washington (this report), and 2) Hawaiian waters. No habitat issues are known to be of concern for this species.

California, Oregon, Washington Off the U.S. West coast, Risso's dolphins are commonly seen on the shelf in the Southern California Bight and in slope and offshore waters of California, Oregon and Washington. Based on sighting patterns from recent aerial and shipboard surveys conducted in these three states during different seasons, animals found off California during the colder water months are thought to shift northward into Oregon and Washington as water temperatures increase in late spring and summer (Green et al. 1992). The southern end of this population's range is not well documented, but previous surveys have shown a conspicuous 500 nmi distributional gap between these animals and Risso's dolphins sighted south of Baja California and in the Gulf of California (Mangels and Gerrodette 1994).

Current estimates of population size are derived from two shipboard surveys within 300 nmi of the coasts of California, Oregon, and Washington in summer/autumn of 2001 (Barlow and Forney 2007) and 2005 (Forney 2007). The distribution of Risso's dolphins throughout this region is highly variable, apparently in response to oceanographic changes on both seasonal and inter-annual time scales (Forney and Barlow 1998). As oceanographic conditions vary, Risso's dolphins may spend time outside the U.S. Exclusive Economic Zone, and therefore a multi-year average abundance estimate is the most appropriate for management within U.S. waters. The 2001-2005 geometric mean abundance estimate for California, Oregon and Washington waters based on the two most recent ship surveys is 11,621 (CV = 0.17) Risso's dolphins (Barlow and Forney 2007, Forney, 2007). The log-normal 20th percentile of the 2001-2005 geometric mean abundance estimate is 10,054 Risso's dolphins. The status of Risso's dolphins off California, Oregon and Washington relative to OSP is not known, and there are insufficient data to evaluate potential trends in abundance. No habitat issues are known to be of concern for this species.

Hawai`i Risso's dolphins are found in tropical to warm-temperate waters worldwide (Kruse et al. 1999). Although they have been considered rare in Hawaiian waters (Shallenberger (1981), six sightings were made during a 2002 survey of the U.S. Exclusive Economic Zone (EEZ) of the Hawaiian Islands. There are five stranding records from the main islands (Nitta 1991; Maldini 2005).

As part of the Marine Mammal Research Program of the Acoustic Thermometry of Ocean Climate (ATOC) study, a total of twelve aerial surveys were conducted within about 25 nmi of the main Hawaiian Islands in 1993, 1995 and 1998 (Mobley et al. 2000). Only one sighting of a single Risso's dolphin was made, and no abundance estimate was calculated. A 2002 shipboard line-transect survey of the entire Hawaiian Islands EEZ resulted in an abundance estimate of 2,351 (CV=0.65) Risso's dolphins (Barlow 2003). This is currently the best available abundance estimate for this stock. The log-normal 20th percentile of the 2002 abundance estimate is 1,426 Risso's dolphins. The status of Risso's dolphins in Hawaiian waters relative to OSP is unknown, and there are insufficient data to evaluate trends in abundance.

Rough-Toothed Dolphin (*Steno bredanensis*)

Rough-toothed dolphins are found throughout the world in tropical and warm-temperate waters (Miyazaki and Perrin 1994). They are present around all the main Hawaiian Islands (Shallenberger 1981; Tomich 1986) and have been observed at least as far northwest as French Frigate Shoals

(Nitta and Henderson 1993). Recent sightings of rough-toothed dolphins were made during a 2002 shipboard survey of waters within the U.S. Exclusive Economic Zone (EEZ) of the Hawaiian Islands. Eight strandings have been reported from Maui, Oahu, and the island of Hawaii (Nitta 1991; Maldini 2005). Nothing is known about stock structure for this species in the North Pacific. Photographic identification studies around the main Hawaiian Islands have not demonstrated any inter-island movement of this species (R.W. Baird, pers. comm.). For the Marine Mammal Protection Act (MMPA) stock assessment reports, there is a single Pacific management stock including only animals found within the U.S. EEZ of the Hawaiian Islands.

A population estimate for this species has been made in the eastern tropical Pacific (Wade and Gerrodette 1993), but it is not known whether these animals are part of the same population that occurs around the Hawaiian Islands. As part of the Marine Mammal Research Program of the Acoustic Thermometry of Ocean Climate (ATOC) study, a total of twelve aerial surveys were conducted within about 25 nmi of the main Hawaiian Islands in 1993, 1995 and 1998. An abundance estimate of 123 (CV=0.63) rough-toothed dolphins was calculated from the combined survey data (Mobley et al. 2000). This study underestimated the total number of rough-toothed dolphins within the U.S. EEZ off Hawaii, because areas around the Northwestern Hawaiian Islands (NWHI) and beyond 25 nautical miles from the main islands were not surveyed. Furthermore, the data on which this estimate was based are now over 5 years old. A 2002 shipboard line-transect survey of the entire Hawaiian Islands EEZ resulted in an abundance estimate of 19,904 (CV=0.52) rough-toothed dolphins (Barlow 2003). This is currently the best available abundance estimate for this stock. The log-normal 20th percentile of the 2002 abundance estimate for Hawaiian Islands EEZ waters is 13,184 rough-toothed dolphins.

The status of rough-toothed dolphins in Hawaiian waters relative to OSP is unknown, and there are insufficient data to evaluate trends in abundance. No habitat issues are known to be of concern for this species. They are not listed as "threatened" or "endangered" under the Endangered Species Act (1973), nor as "depleted" under the MMPA.

Spinner Dolphin (*Stenella longirostris*)

Spinner dolphins are found throughout the world in tropical and warm-temperate waters (Perrin and Gilpatrick 1994). They are common and abundant throughout the entire Hawaiian archipelago (Shallenberger 1981; Norris and Dohl 1980; Norris et al. 1994), and 26 strandings have been reported (Maldini 2005). Recent sighting locations from a 2002 shipboard survey of waters within the U.S. Exclusive Economic Zone (EEZ) of the main

Hawaiian Islands (Barlow 2003) are shown in Figure 1. There is some suggestion from an intensive study of spinner dolphins off the Kona Coast of Hawaii that the waters surrounding this island may have a large, relatively stable "resident" population (Norris et al. 1994). Currently, it is not known whether spinner dolphins regularly move between islands or island groups, or whether separate populations may exist. Hawaiian spinner dolphins belong to a stock that is separate from those involved in the tuna purse-seine fishery in the eastern tropical Pacific (Perrin 1975; Dizon et al. 1994). The Hawaiian form is referable to the subspecies *S. longirostris longirostris*, which occurs pantropically (Perrin 1990). For the Marine Mammal Protection Act (MMPA) stock assessment reports, there is a single Pacific management stock including only animals found within the U.S. EEZ of the Hawaiian Islands.

Although spinner dolphins are clearly among the most abundant cetaceans in Hawaiian waters, previously available population estimates apply only to the west coast of Hawaii. Norris et al. (1994) photo-identified 192 individuals along the west coast of Hawaii and estimated 960 animals for this area in 1979-1980. Östman (1994) photo-identified 677 individual spinner dolphins in the same area from 1989 to 1992. Using the same estimation procedures as Norris et al. (1994), Östman (1994) estimated a population size of 2,334 for his study area along the Kona coast of Hawaii. As part of the Marine Mammal Research Program of the Acoustic Thermometry of Ocean Climate (ATOC) study, a total of twelve aerial surveys were conducted within about 25 nmi of the main Hawaiian Islands in 1993, 1995 and 1998. An abundance estimate of 3,184 (CV=0.37) spinner dolphins was calculated from the combined survey data (Mobley et al. 2000). This study underestimated the total number of spinner dolphins within the U.S. EEZ off Hawaii, because areas around the Northwestern Hawaiian Islands (NWHI) and beyond 25 nautical miles from the main islands were not surveyed. Furthermore, the data on which this estimate was based are now over 5 years old. A 2002 shipboard line-transect survey of the entire Hawaiian Islands EEZ resulted in an abundance estimate of 2,805 (CV=0.66) spinner dolphins (Barlow 2003). This is currently the best available abundance estimate for this stock, but it may be negatively biased because relatively little survey effort occurred in near-shore areas where these dolphins are abundant. Near-shore aerial surveys are currently being conducted for this species. The log-normal 20th percentile of the 2002 abundance estimate is 1,690 spinner dolphins.

The status of spinner dolphins in Hawaiian waters relative to OSP is unknown, and there are insufficient data to evaluate trends in abundance. A habitat issue of increasing concern is the potential effect of swim-with-dolphins programs and other tourism activities on spinner dolphins around the main Hawaiian Islands. Spinner dolphins are not listed as “threatened”

or "endangered" under the Endangered Species Act (1973), nor as "depleted" under the MMPA.

Pantropical Spotted Dolphin (*Stenella attenuata*)

Pantropical spotted dolphins are primarily found in tropical and subtropical waters worldwide (Perrin and Hohn 1994). Much of what is known about the species in the North Pacific has been learned from specimens obtained in the large directed fishery in Japan and in the eastern tropical Pacific (ETP) tuna purse-seine fishery (Perrin and Hohn 1994). These dolphins are common and abundant throughout the Hawaiian archipelago, particularly in channels between islands, over offshore banks (e.g. Penguin Banks), and off the lee shores of the islands (see Shallenberger 1981). Twelve strandings of this species have been documented in Hawaii (Nitta 1991, Maldini 2005). Morphological differences and distribution patterns have been used to establish that the spotted dolphins around Hawaii belong to a stock that is distinct from those in the ETP (Perrin 1975; Dizon et al. 1994; Perrin et al. 1994b). For the Marine Mammal Protection Act (MMPA) stock assessment reports, there is a single Pacific management stock including only animals found within the U.S. EEZ of the Hawaiian Islands. Spotted dolphins involved in eastern tropical Pacific tuna purse-seine fisheries are managed separately under the MMPA.

Population estimates are available for Japanese waters (Miyashita 1993) and the eastern tropical Pacific (Wade and Gerrodette 1993). As part of the Marine Mammal Research Program of the Acoustic Thermometry of Ocean Climate (ATOC) study, a total of twelve aerial surveys were conducted within about 25 nmi of the main Hawaiian Islands in 1993, 1995 and 1998. An abundance estimate of 2,928 (CV=0.45) pantropical spotted dolphins was calculated from the combined survey data (Mobley et al. 2000). This abundance underestimates the total number of pantropical spotted dolphins within the U.S. EEZ off Hawaii, because areas around the Northwestern Hawaiian Islands (NWHI) and beyond 25 nautical miles from the main islands were not surveyed. Furthermore, the data on which this estimate was based are now over 5 years old. A 2002 shipboard line-transect survey of the entire Hawaiian Islands EEZ resulted in an abundance estimate of 10,260 (CV=0.41) pantropical spotted dolphins (Barlow 2003). This is currently the best available abundance estimate for pantropical spotted dolphins within the Hawaiian Islands EEZ.

No abundance estimates are currently available for pantropical spotted dolphins in U.S. EEZ waters of Palmyra Island; however, density estimates for pantropical spotted dolphins in other Pacific regions can provide a range of likely abundance estimates in this unsurveyed region. Published estimates

of pantropical spotted dolphins (animals per km2) in the Pacific are: 0.0046 (CV=0.41) for the U.S. EEZ of the Hawaiian Islands (Barlow 2003); 0.0407 (CV=0.45) for nearshore waters surrounding the main Hawaiian Islands (Mobley et al. 2000), 0.0678 (CV=0.15) and 0.1064 (CV=0.09) for the eastern tropical Pacific Ocean (Wade and Gerrodette 1993; Ferguson and Barlow 2003), and 0.0731 (CV=0.33) for the eastern tropical Pacific Ocean west of 120°W and north of 5°N (Ferguson and Barlow 2003). Applying the lowest and highest of these density estimates to U.S. EEZ waters surrounding Palmyra Island (area size = 347,216 km2) yields a range of plausible abundance estimates of 1,590 - 36,928 pantropical spotted dolphins. The log-normal 20th percentile of the 2002 abundance estimate for the Hawaiian Islands EEZ (Barlow 2003) is 7,362 pantropical spotted dolphins. No minimum population estimate is currently available for waters surrounding Palmyra Island, but the pantropical spotted dolphin density estimates from other Pacific regions (Barlow 2003, Mobley et al. 2000, Wade and Gerrodette 1993, Ferguson and Barlow 2003; see above) can provide a range of likely values. The lognormal 20th percentiles of plausible abundance estimates for the Palmyra Island EEZ, based on the densities observed elsewhere, range from 1,141 - 34,238 pantropical spotted dolphins.

The status of pantropical spotted dolphins in Hawaiian waters relative to OSP is unknown, and there are insufficient data to evaluate trends in abundance. No habitat issues are known to be of concern for this species. They are not listed as "threatened" or "endangered" under the Endangered Species Act (1973), nor as "depleted" under the MMPA.

Striped Dolphin (*Stenella coeruleoalba*)

Striped dolphins are distributed world-wide in tropical and warm-temperate pelagic waters. They are not listed as "threatened" or "endangered" under the Endangered Species Act nor as "depleted" under the MMPA. For the Marine Mammal Protection Act (MMPA) stock assessment reports, striped dolphins within the Pacific U.S. Exclusive Economic Zone are divided into two discrete, non-contiguous areas: 1) waters off California, Oregon and Washington and 2) waters around Hawaii.

California, Oregon, Washington On recent shipboard surveys extending about 300 nmi offshore of California, they were sighted within about 100-300 nmi from the coast. No sightings have been reported for Oregon and Washington waters, but striped dolphins have stranded in both states (Oregon Department of Fish and Wildlife, unpublished data; Washington Department of Fish and Wildlife, unpublished data). Striped dolphins are also commonly found in the central North Pacific, but sampling between this region and California has been insufficient to determine whether the

distribution is continuous. Based on sighting records off California and Mexico, striped dolphins appear to have a continuous distribution in offshore waters of these two regions (Perrin et al. 1985; Mangels and Gerrodette 1994). No information on possible seasonality in distribution is available, because the California surveys, which extended 300 nmi offshore, were conducted only during the summer/fall period.

Abundance is estimated from two summer/fall shipboard surveys conducted within 300 nmi of the coasts of California, Oregon and Washington in 2001 (Barlow and Forney 2007) and 2005 (Forney 2007). The abundance of striped dolphins in this region appears to be variable between years and may be affected by oceanographic conditions, as with other odontocete species (Forney 1997, Forney and Barlow 1998). Because animals may spend time outside the U.S. Exclusive Economic Zone as oceanographic conditions change, a multi-year average abundance estimate is the most appropriate for management within U.S. waters. The 2001-2005 geometric mean abundance estimate for California, Oregon and Washington waters based on the 2001 and 2005 ship surveys is 17,925 (CV=0.37) striped dolphins (Barlow and Forney 2007, Forney 2007). The log-normal 20th percentile of the 2001-2005 mean abundance estimate is 13,251 striped dolphins. The status of striped dolphins in California relative to OSP is not known, and there are insufficient data to evaluate potential trends in abundance. No habitat issues are known to be of concern for this species.

Hawai`i They have been documented in the Hawaiian Islands from 20 strandings (Nitta 1991, Maldini 2005), although sightings have historically been infrequent (Shallenberger 1981, Mobley et al. 2000). A comprehensive shipboard survey of the Hawaiian Exclusive Economic Zone (EEZ), resulted in 15 sightings of striped dolphins (Barlow 2003). Striped dolphins have been intensively exploited in the western North Pacific, where three migratory stocks are provisionally recognized (Kishiro and Kasuya 1993). In the eastern Pacific all striped dolphins are provisionally considered to belong to a single stock (Dizon et al. 1994).

Population estimates are available for Japanese waters (Miyashita 1993) and the eastern tropical Pacific (Wade and Gerrodette 1993), but it is not known whether any of these animals are part of the same population that occurs around the Hawaiian Islands. As part of the Marine Mammal Research Program of the Acoustic Thermometry of Ocean Climate (ATOC) study, a total of twelve aerial surveys were conducted within about 25 nmi of the main Hawaiian Islands in 1993, 1995 and 1998. An abundance estimate of 114 (CV=1.19) striped dolphins was calculated from the combined survey data (Mobley et al. 2000). This study underestimated the total number of striped dolphins within the U.S. EEZ off Hawaii, because areas around the

Northwestern Hawaiian Islands (NWHI) and beyond 25 nautical miles from the main islands were not surveyed. Furthermore, the data on which this estimate was based are now over 5 years old. A 2002 shipboard line-transect survey of the entire Hawaiian Islands EEZ resulted in an abundance estimate of 10,385 (CV=0.48) striped dolphins (Barlow 2003). This is currently the best available abundance estimate for this stock. The log-normal 20th percentile of the 2002 abundance estimate is 7,078 striped dolphins. The status of striped dolphins in Hawaiian waters relative to OSP is unknown, and there are insufficient data to evaluate trends in abundance. No habitat issues are known to be of concern for this species.

Bottlenose Dolphin (*Tursiops truncatus*)

Bottlenose dolphins are distributed worldwide in tropical and warm-temperate waters. For the Marine Mammal Protection Act (MMPA) stock assessment reports, bottlenose dolphins within the Pacific U.S. Exclusive Economic Zone are divided into three stocks: 1) California coastal stock, 2) California, Oregon and Washington offshore stock, and 3) Hawaiian stock.

California, Oregon, Washington In many regions, including California, separate coastal and offshore populations are known (Walker 1981; Ross and Cockcroft 1990; Van Waerebeek et al. 1990). Based on nuclear and mtDNA analyses, Lowther (2006) identified 5 haplotypes from 29 coastal animals and 25 haplotypes from 40 offshore animals from the U.S. west coast. There were no shared haplotypes between coastal and offshore animals and significant genetic differentiation between the two ecotypes was evident.

1) Coastal: California coastal bottlenose dolphins are found within about one kilometer of shore (Hansen, 1990; Carretta et al. 1998; Defran and Weller 1999) primarily from Point Conception south into Mexican waters, at least as far south as San Quintin, Mexico. In southern California, animals are found within 500 m of the shoreline 99% of the time and within 250 m 90% of the time (Hanson and Defran 1993). Oceanographic events appear to influence the distribution of animals along the coasts of California and Baja California, Mexico, as indicated by a change in residency patterns along Southern California and a northward range extension into central California after the 1982-83 El Niño (Hansen and Defran 1990; Wells et al. 1990). Since the 1982-83 El Niño, which increased water temperatures off California, they have been consistently sighted in central California as far north as San Francisco. Photo-identification studies have documented north-south movements of coastal bottlenose dolphins (Hansen 1990; Defran et al. 1999), and monthly counts based on surveys between the U.S./Mexican border and Conception are variable (Carretta et al. 1998), indicating that

animals are moving into and out of this area.

Based on photographic mark-recapture surveys conducted along the San Diego coast in 2004 and 2005, the most recent estimate of population size is 323 dolphins (CV = 0.13, 95% CI 259-430; Dudzik et al. 2006). This estimate does not reflect that approximately 35% of dolphins encountered lack identifiable dorsal fin marks (Defran and Weller 1999). If 35% of all animals lack distinguishing marks, then the true population size would be closer to 450-500 animals. Comparing the most recent population size estimate with those obtained from 1987-89 (354 dolphins, 95% CI 330 – 390) and 1996-98 (356 dolphins, 95% CI 306 – 437; Dudzik 1999) suggests that the population size has been stable for approximately 20 years. Older estimates of population size for this stock range from 234 (95% CI 205-263) to 285 (95% CI 265- 306) animals for the period 1985-89 (Defran and Weller 1999). Because coastal bottlenose dolphins spend an unknown amount of time in Mexican waters, where they may be subject to mortality in Mexican fisheries, an average abundance estimate for California only is the most appropriate for U.S. management of this stock. The status of coastal bottlenose dolphins in California relative to OSP is not known, and there is no evidence of a trend in abundance. They are not listed as "threatened" or "endangered" under the Endangered Species Act nor as "depleted" under the MMPA.

2) Offshore: Based on aerial surveys conducted during winter/spring 1991-92 (Forney et al. 1995) and shipboard surveys conducted in summer/fall 1991 (Barlow 1995), no seasonality in distribution is apparent (Forney and Barlow 1998). The most recent shipboard surveys conducted within 300 nmi of the coasts of California, Oregon, and Washington were in and 2001 (Barlow and Forney 2007) and 2005 (Forney 2007). Because the distribution of bottlenose dolphins appears to vary interannually and they may spend time outside the U.S. Exclusive Economic Zone, a multi-year average abundance estimate is the most appropriate for management within U.S. waters. The most comprehensive multi-year average abundance is the geometric mean abundance estimate for California, Oregon and Washington waters based on the 2001-2005 ship surveys, or 3,495 (CV = 0. 0.31) offshore bottlenose dolphins (Barlow and Forney 2007, Forney 2007). The log-normal 20th percentile of the 2001-2005 average abundance estimate is 2,706 offshore bottlenose dolphins. The status of offshore bottlenose dolphins in California relative to OSP is not known, and there are insufficient data to evaluate trends in abundance.

Hawai`i Bottlenose dolphins are widely distributed throughout the world in tropical and warm temperate waters. The species is primarily coastal in

much of its range, but there are populations in some offshore deepwater areas as well. Separate offshore and coastal forms have been identified along continental coasts in several areas (Ross and Cockcroft 1990; Van Waerebeek et al. 1990), and there is some evidence that similar onshore offshore forms may exist in Hawaiian waters (Martien et al 2005; Baird et al, in prep). Bottlenose dolphins are common throughout the Hawaiian Islands, from the island of Hawaii to Kure Atoll (Shallenberger 1981). Twelve strandings have been reported within the main Hawaiian Islands (Nitta 1991, Maldini 2003). Recent sighting locations based on a 2002 shipboard survey of waters within the U.S. Exclusive Economic Zone (EEZ) of the Hawaiian Islands are shown in Figure 1. In the Hawaiian Islands, they are found in shallow inshore waters and deep water (Baird et al. 2003). In their analysis of sightings of bottlenose dolphins in the eastern tropical Pacific (ETP), Scott and Chivers (1990) noted that there was a large hiatus between the westernmost sightings and the Hawaiian Islands. These data suggest that bottlenose dolphins in Hawaiian waters, belong to a separate stock from those in the ETP. Recent nearshore photo-identification studies off Oahu, Maui, Lanai, Kauai, Niihau, and Hawaii suggest limited movement of bottlenose dolphins between islands and into offshore waters (Baird et al. 2002; 2003).

Photographic mark-recapture studies off Maui and Lanai estimated 134 (95% C.I. 107-180) bottlenose dolphins inhabiting that area (Baird et al. 2002). More recently, a minimum of 235 distinct bottlenose dolphins were identified around all the main Hawaiian Islands (Baird et al. 2006). As part of the Marine Mammal Research Program of the Acoustic Thermometry of Ocean Climate (ATOC) study, a total of twelve aerial surveys were conducted within about 25 nmi of the main Hawaiian Islands in 1993, 1995 and 1998. An abundance estimate of 743 (CV=0.56) bottlenose dolphins was calculated from the combined survey data (Mobley et al. 2000). This abundance underestimates the total number of bottlenose dolphins within the U.S. EEZ off Hawaii, because areas around the Northwestern Hawaiian Islands (NWHI) and beyond 25 nautical miles from the main islands were not surveyed. Furthermore, the data on which this estimate was based are now over 5 years old. A 2002 shipboard line-transect survey of the entire Hawaiian Islands EEZ resulted in an abundance estimate of 3,215 (CV= 0.59) bottlenose dolphins (Barlow 2006). This is currently the best available abundance estimate for the Hawaiian Islands EEZ stock. If the bottlenose dolphins in the 4-Island Region comprise a distinct stock, the most recent available estimate is the number of individuals identified during photo-identification studies between 1999 and 2003, 141 dolphins (Baird et al., in prep). The log-normal 20th percentile of the 2002 abundance estimate is 2,029 bottlenose dolphins. The minimum population estimate for bottlenose dolphins in the Four-Island Region, based on photo-identification methods, is

68 dolphins (the number or of unique individuals identified between 1999 and 2003; Baird et al. 2003. The status of bottlenose dolphins in Hawaiian waters relative to OSP is unknown, and there are insufficient data to evaluate trends in abundance. No habitat issues are known to be of concern for this species. They are not listed as "threatened" or "endangered" under the Endangered Species Act (1973), nor as "depleted" under the MMPA.

Fraser's Dolphin (*Lagenodelphis hosei*)

Fraser's dolphins are distributed worldwide in tropical waters (Perrin et al. 1994b). They have only recently been documented within the U.S. Exclusive Economic Zone (EEZ) of the Hawaiian Islands, during a 2002 cetacean survey (Barlow 2003). No strandings of Fraser's dolphins have been documented in the Hawaiian Islands (Nitta 1991; Maldini 2005). For the Marine Mammal Protection Act (MMPA) stock assessment reports, there is a single Pacific management stock including only animals found within the U.S. EEZ of the Hawaiian Islands. Population estimates for Fraser's dolphins have been made in the eastern tropical Pacific (Wade and Gerrodette 1993), but it is not known whether these animals are part of the same population that occurs around the Hawaiian Islands and in the central North Pacific. No sightings of this species were made during twelve aerial surveys, conducted as part of the Marine Mammal Research Program of the Acoustic Thermometry of Ocean Climate (ATOC) study, within about 25 nmi of the main Hawaiian Islands in 1993, 1995 and 1998 (Mobley et al. 2000). A 2002 shipboard line-transect survey of the entire Hawaiian Islands EEZ resulted in an abundance estimate of 16,836 (CV=1.11) Fraser's dolphins (Barlow 2003). This is currently the best available abundance estimate for this stock. The log-normal 20th percentile of the 2002 abundance estimate is 7,917 Fraser's dolphins. The status of Fraser's dolphins in Hawaiian waters relative to OSP is unknown, and there are insufficient data to evaluate trends in abundance. No habitat issues are known to be of concern for this species. They are not listed as "threatened" or "endangered" under the Endangered Species Act (1973), nor as "depleted" under the MMPA.

Blainville's Beaked Whale (*Mesoplodon densirostris*)

Blainville's beaked whale has a cosmopolitan distribution in tropical and temperate waters, apparently the most extensive known distribution of any *Mesoplodon* species (Mead 1989). Two strandings were reported in 1961 from Midway Island (Galbreath 1963) and another in 1983 from Laysan Island (Nitta 1991). Sixteen sightings were reported from the main islands by Shallenberger (1981), who suggested that Blainville's beaked whales were present off the Waianae Coast of Oahu for prolonged periods annually. Three sightings were made during a 2002 shipboard survey of waters within

the U.S. Exclusive Economic Zone (EEZ) of the Hawaiian Islands (Barlow 2003). While nothing is known about stock structure, some genetic samples have been collected recently from around the main Hawaiian islands, and there have been re-sightings of individuals from the island of Hawaii (R.W. Baird, pers. comm.).

As part of the Marine Mammal Research Program of the Acoustic Thermometry of Ocean Climate (ATOC) study, a total of twelve aerial surveys were conducted within about 25 nmi of the main Hawaiian Islands in 1993, 1995 and 1998. Seven sightings of Blainville's beaked whales were made. An abundance estimate of 68 (CV=0.60) Blainville's beaked whales was calculated from the combined survey data (Mobley et al. 2000). This study underestimated the total number of Blainville's beaked whales within the U.S. EEZ off Hawaii, because areas around the Northwestern Hawaiian Islands (NWHI) and beyond 25 nautical miles from the main islands were not surveyed. Furthermore, this species is known to spend a large proportion of time diving, causing additional downward bias in the abundance estimate. The data on which this estimate was based are now over 5 years old. A 2002 shipboard line-transect survey of the entire Hawaiian Islands EEZ resulted in an abundance estimate of 2,138 (CV=0.77) Blainville's beaked whales (Barlow 2003), including a correction factor for missed diving animals. This is currently the best available abundance estimate for this stock. The log-normal 20th percentile of the 2002 abundance estimate is 1,204 Blainville's beaked whales. The status of Blainville's beaked whales in Hawaiian waters relative to OSP is unknown, and there are insufficient data to evaluate trends in abundance. They are not listed as "threatened" or "endangered" under the Endangered Species Act (1973), nor as "depleted" under the MMPA. The increasing levels of anthropogenic noise in the world's oceans has been suggested to be a habitat concern for whales (Richardson et al. 1995), particularly for deep-diving whales like Blainville's beaked whales that feed in the oceans' "sound channel".

Cuvier's Beaked Whale (*Ziphius cavirostris*)

Cuvier's beaked whales are distributed widely throughout deep waters of all oceans (Heyning 1989). Off the U.S. west coast, this species is the most commonly encountered beaked whale. For the Marine Mammal Protection Act (MMPA) stock assessment reports, Cuvier's beaked whales within the Pacific U.S. Exclusive Economic Zone are divided into three discrete, noncontiguous areas: 1) waters off California, Oregon and Washington (this report), 2) Alaskan waters, and 3) Hawaiian waters. No habitat issues are known to be of concern for this species, but in recent years questions have been raised regarding potential effects of human-made sounds on deep-diving cetacean species, such as Cuvier's beaked whales (Richardson et al.

1995). In particular, active sonar has been implicated in the mass stranding of beaked whales in the Mediterranean Sea (Frantzis 1998) and more recently in the Caribbean (U.S. Dept. of Commerce and Secretary of the Navy 2001). They are not listed as "threatened" or "endangered" under the Endangered Species Act nor as "depleted" under the MMPA.

California, Oregon, Washington Off the U.S. west coast, this species is the most commonly encountered beaked whale. Although Cuvier's beaked whales have been sighted along the U.S. west coast on several line transect surveys utilizing both aerial and shipboard platforms, sightings have been too rare to produce reliable population estimates. Previous abundance estimates have been imprecise and biased downward by an unknown amount because of the large proportion of time this species spends submerged, and because the ship surveys on which they were based covered only California waters, and thus could not observe animals off Oregon/Washington. Furthermore, there were a large number of unidentified beaked whale sightings, which were probably either *Mesoplodon* sp. or Cuvier's beaked whales (*Ziphius cavirostris*). Updated analyses are based on 1) combining data from two surveys conducted within 300 nmi of the coasts of California, Oregon and Washington in 2001 (Barlow and Forney 2007) and 2005 (Forney 2007), 2) whenever possible, assigning unidentified beaked whale sightings to *Mesoplodon* spp. or *Ziphius cavirostris* based on written descriptions, size estimates, and 'most probable identifications' made by the observers at the time of the sightings, and 3) estimating a correction factor for animals missed, based on a model of their diving behavior, detection distances, and the searching behavior of observers (Barlow 1999). An estimated 23% of trackline groups are estimated to be seen. Because animals probably spend time outside the U.S. Exclusive Economic Zone, a multi-year average abundance estimate is the most appropriate for management within U.S. waters. The 2001-2005 geometric mean abundance estimate for California, Oregon and Washington waters based on the above analyses is 2,830 (CV=0.73) Cuvier's beaked whales. Based on the above abundance estimate and CV, the minimum population estimate (defined as the log-normal 20th percentile of the abundance estimate) for Cuvier's beaked whales in California, Oregon, and Washington is 1,629 animals.

Hawai`i In Hawaii, five strandings have been reported from Midway Islands, Pearl and Hermes Reef, Oahu, and Hawaii Islands (Shallenberger 1981; Galbreath 1963; Richards 1952; Nitta 1991; Maldini 2005). Sightings have been reported off Lanai and Maui (Shallenberger 1981) and Hawaii, Ni'ihau, and Kauai (Mobley 2000, Baird et al. 2004). Four sightings were made during a 2002 shipboard survey of waters within the U.S. Exclusive Economic Zone (EEZ) of the Hawaiian Islands (Barlow 2003). While nothing is known about stock structure, some genetic samples have been collected

recently from around the island of Hawaii, and there have been resightings of individuals from the island of Hawaii (R.W. Baird, pers. comm.).

Wade and Gerrodette (1993) made an estimate for Cuvier's beaked whales in the eastern tropical Pacific, but it is not known whether any of these animals are part of the same population that occurs around the Hawaiian Islands. As part of the Marine Mammal Research Program of the Acoustic Thermometry of Ocean Climate (ATOC) study, a total of twelve aerial surveys were conducted within about 25 nmi of the main Hawaiian Islands in 1993, 1995 and 1998. Seven sightings of Cuvier's beaked whales were made. An abundance estimate of 43 (CV=0.51) Cuvier's beaked whales was calculated from the combined survey data (Mobley et al. 2000). This study underestimated the total number of Cuvier's beaked whales within the U.S. EEZ off Hawaii, because areas around the Northwestern Hawaiian Islands (NWHI) and beyond 25 nautical miles from the main Islands were not surveyed. Furthermore, this species is known to spend a large proportion of time diving, causing additional downward bias in the abundance estimate. The data on which this estimate was based are now over 5 years old. A 2002 shipboard line-transect survey of the entire Hawaiian Islands EEZ resulted in an abundance estimate of 12,728 (CV=0.83) Cuvier's beaked whales (Barlow 2003), including a correction factor for missed diving animals. This is currently the best available abundance estimate for this stock. The log-normal 20th percentile of the 2002 abundance estimate is 6,919 Cuvier's beaked whales.

Alaska The distribution of Cuvier's beaked, or goosebeak, whale is known primarily from strandings, which indicate that it is the most widespread of the beaked whales and is distributed in all oceans and most seas except in the high polar waters (Moore 1963). In the Pacific, they range north to the northern Gulf of Alaska, the Aleutian Islands, and the Commander Islands (Rice 1986, 1998). In the northeastern Pacific from Alaska to Baja California, no obvious pattern of seasonality to strandings has been identified (Mitchell 1968). Strandings of Cuvier's beaked whales are the most numerous of all beaked whales, indicating that they are probably not as rare as originally thought (Heyning 1989). Observations reveal that the blow is low, diffuse, and directed forward (Backus and Schevill 1961, Norris and Prescott 1961), making sightings more difficult, and there is some evidence that they avoid vessels by diving (Heyning 1989). Reliable estimates of abundance for this stock are currently unavailable.

Baird's Beaked Whale (*Berardius bairdii*)

Baird's beaked, or giant bottlenose, whale inhabits the North Pacific Ocean and adjacent seas (Bering Sea, Okhotsk Sea, Sea of Japan, and the Sea of

Cortez in the southern Gulf of California, Mexico), with the best-known populations occurring in the coastal waters around Japan (Balcomb 1989). There are insufficient data to apply the phylogeographic approach to stock structure (Dizon et al. 1992) for Baird's beaked whale. Therefore, Baird's beaked whale stocks are defined as the two non-contiguous areas within Pacific U. S. waters where they are found: 1) Alaska and 2) California/Oregon/Washington. Baird's beaked whales are not listed as "depleted" under the MMPA or listed as "threatened" or "endangered" under the Endangered Species Act. No habitat issues are known to be of concern for this species, but in recent years questions have been raised regarding potential effects of human-made sounds on deep-diving cetacean species, such as Baird's beaked whales (Richardson et al. 1995). In particular, active sonar has been implicated in the mass stranding of beaked whales in the Mediterranean Sea (Frantzis 1998) and more recently in the Caribbean (U.S. Dept. of Commerce and Secretary of the Navy 2001).

California, Oregon, Washington Along the U.S. west coast, Baird's beaked whales have been seen primarily along the continental slope from late spring to early fall. They have been seen less frequently and are presumed to be farther offshore during the colder water months of November through April. Two summer/fall shipboard surveys were conducted within 300 nmi of the coasts of California, Oregon and Washington in 2001 (Barlow and Forney 2007) and 2005 (Forney 2007). Because the distribution of Baird's beaked whale varies and animals probably spend time outside the U.S. Exclusive Economic Zone, a multi-year average abundance estimate is the most appropriate for management within U.S. waters. The 2001-2005 geometric mean abundance estimate for California, Oregon and Washington waters based on the above two ship surveys is 540 (CV=0.54) Baird's beaked whales (Barlow and Forney 2007; Forney 2007). This abundance estimate includes correction factors for the proportion of animals missed, based on a model of their diving behavior, detection distances, and the searching behavior of observers (Barlow 1999). About 96% of all trackline groups are estimated to be seen. The log-normal 20th percentile of the 2001-2005 weighted average abundance estimate is 353 Baird's beaked whales. The status of Baird's beaked whales in California, Oregon and Washington waters relative to OSP is not known, and there are insufficient data to evaluate trends in abundance.

Alaska Within the North Pacific Ocean, Baird's beaked whales have been sighted in virtually all areas north of 30EN in deep waters over the continental shelf, particularly in regions with submarine escarpments and seamounts (Ohsumi 1983, Kasuya and Ohsumi 1984, Kasuya 2002). The range of the species extends north from Cape Navarin (62° N) and the central Sea of Okhotsk (57° N) to St. Matthew Island, the Pribilof Islands in

the Bering Sea, and the northern Gulf of Alaska (Rice 1986, Rice 1998, Kasuya 2002, NMFS unpublished data, Fig. 32). An apparent break in distribution occurs in the eastern Gulf of Alaska, but from the mid-Gulf to the Aleutian Islands and in the southern Bering Sea there are numerous sighting records (Kasuya and Ohsumi 1984, Forney and Brownell 1996, Moore et al. 2002, NMFS unpublished data). In the Sea of Okhotsk and the Bering Sea, Baird's beaked whales arrive in April-May, are numerous during the summer, and decrease in October (Tomilin 1957, Kasuya 2002). During this time they are rarely found in offshore waters and their winter distribution is unknown (Kasuya 2002). They are the most commonly seen beaked whales within their range, perhaps because they are relatively large and gregarious, traveling in schools of a few to several dozen, making them more noticeable to observers than other beaked whale species. Baird's beaked whales are migratory, arriving in continental slope waters during summer and fall months when surface water temperatures are the highest (Dohl et al. 1983, Kasuya 1986). Reliable estimates of abundance for this stock are currently unavailable

Longman's Beaked Whale (*Indopacetus pacificus*)

Longman's beaked whale is considered one of the rarest and least known cetacean species (Jefferson et al. 1993; Rice 1998; Dalebout et al 2003). Recent genetic studies (Dalebout et al. 2003) have revealed that sightings of 'tropical bottlenose whales' (*Hyperoodon* sp.; Pitman et al. 1999) in the Indopacific region were in fact Longman's beaked whales, providing the first description of the external appearance of this species. Although originally described as *Mesoplodon pacificus* (Longman 1926), it has been proposed that this species is sufficiently unique to be placed within its own genus, *Indopacetus* (Moore 1968; Dalebout et al. 2003). The distribution of Longman's beaked whale, as determined from stranded specimens and sighting records of 'tropical bottlenose whales', includes tropical waters from the eastern Pacific westward through the Indian Ocean to the eastern coast of Africa. No strandings of Longman's beaked whales have been documented in Hawaiian waters, although numerous strandings of unidentified beaked whales have been reported (Nitta 1991; Maldini 2005). A 2002 shipboard line-transect survey of the entire Hawaiian Islands EEZ resulted in an abundance estimate of 766 (CV=1.05) Longman's beaked whales (Barlow 2003). This is currently the best available abundance estimate for this stock. The log-normal 20th percentile of the 2002 abundance estimate is 371 Longman's beaked whales. The status of Longman's beaked whales in Hawaiian waters relative to OSP is unknown, and there are insufficient data to evaluate trends in abundance. They are not listed as "threatened" or "endangered" under the Endangered Species Act (1973), nor as "depleted" under the MMPA.

Mesoplodont Beaked Whale (*Mesoplodon* spp.)

Mesoplodont beaked whales are distributed throughout deep waters and along the continental slopes of the North Pacific Ocean. At least 5 species in this genus have been recorded off the U.S. west coast, but due to the rarity of records and the difficulty in identifying these animals in the field, virtually no species-specific information is available (Mead 1989). The six species known to occur in this region are: Blainville's beaked whale (*M. densirostris*), Perrin's beaked whale (*M. perrini*), Lesser beaked whale (*M. peruvianus*), Stejneger's beaked whale (*M. stejnegeri*), Gingko-toothed beaked whale (*M. gingkodens*), and Hubbs' beaked whale (*M. carlhubbsi*). Insufficient sighting records exist off the U.S. west coast to determine any possible spatial or seasonal patterns in the distribution of mesoplodont beaked whales. For the Marine Mammal Protection Act (MMPA) stock assessment reports, three *Mesoplodon* stocks are defined: 1) all *Mesoplodon* species off California, Oregon and Washington (this report), 2) *M. stejnegeri* in Alaskan waters, and 3) *M. densirostris* in Hawaiian waters. The abundance of Blainville's beaked whales for California, Oregon, and Washington, based on the geometric mean of 2001-2005 surveys is 1,206 (CV=). The abundance estimate for mesoplodont beaked whales of unknown species, based on the same 2001-2005 surveys is 421 (CV=0.88). The combined estimate of abundance for all species of *Mesoplodon* beaked whales in California, Oregon, and Washington waters out to 300 nmi is 1,024 (CV=0.77) animals. This estimate does not include sightings of 'unidentified beaked whales' made during 2005, some of which may have been *Mesoplodont* beaked whales (Forney 2007). The minimum population estimate (defined as the log-normal 20th percentile of the abundance estimate) for mesoplodont beaked whales in California, Oregon, and Washington is 576 animals. The status of mesoplodont beaked whales in California, Oregon and Washington waters relative to OSP is not known, and there are insufficient data to evaluate trends in abundance. No habitat issues are known to be of concern for this species, but in recent years questions have been raised regarding potential effects of human-made sounds on deep-diving cetacean species, such as mesoplodont beaked whales (Richardson et al. 1995). In particular, active sonar has been implicated in the mass stranding of beaked whales in the Mediterranean Sea (Frantzis 1998) and more recently in the Bahamas (U.S. Dept. of Commerce and Secretary of the Navy 2001). None of the six species is listed as "threatened" or "endangered" under the Endangered Species Act nor considered "depleted" under the MMPA.

SPECIES LIST

NORTH ATLANTIC
Blue Whale *(Balaenoptera musculus)*
Fin Whale *(Balaenoptera physalus*)
Humpback whale (*Megaptera novaeangliae*)
Sei Whale (*Balaenoptera borealis*)
Bryde's Whale (*Balaenoptera edeni*)
Minke Whale (*Balaenoptera acutorostrata*)
Sperm Whale (*Physeter macrocephalus*)
Killer Whale (*Orcinus orca*)
Short-finned Pilot Whale (*Globicephala macrorhynchus*)
Melon-headed Whale (*Peponocephala electra*)
False Killer Whale (*Pseudorca crassidens*)
Pygmy Killer Whale (*Feresa attenuata*)
Dwarf Sperm Whale (*Kogia sima*)
Pygmy Sperm Whale (*Kogia breviceps*)
Northern Bottlenose Whale (*Hyperoodon ampullatus*)
Risso's Dolphin (*Grampus griseus*)
Short-beaked Common Dolphin (*Delphinus delphis*)
Atlantic White-Sided Dolphin (*Lagenorhynchus obliquidens*)
Rough-Toothed Dolphin (*Steno bredanensis*)
Striped Dolphin (*Stenella coeruleoalba*)
Pantropical Spotted Dolphin (*Stenella attenuata*)
Atlantic Spotted Dolphin (*Stenella frontalis*)
Spinner Dolphin (*Stenella longirostris*)
Bottlenose Dolphin (*Tursiops truncatus*)
Fraser's Dolphin (*Lagenodelphis hosei*)
Clymene Dolphin (*Stenella clymene*)
Blainville's Beaked Whale (*Mesoplodon densirostris*)
Cuvier's Beaked Whale (*Ziphius cavirostris*)
Gervais' Beaked Whale (*Mesoplodon europaeus*)
Mesoplodont Beaked Whale (*Mesoplodon* spp.)

Blue Whale (*Balaenoptera musculus*)
The distribution of the blue whale, *Balaenoptera musculus,* in the western North Atlantic generally extends from the Arctic to at least mid-latitude waters. Blue whales are most frequently sighted in the waters off eastern Canada, with the majority of recent records from the Gulf of St. Lawrence (Sears *et al*. 1987). The blue whale is best considered as an occasional visitor in US Atlantic Exclusive Economic Zone (EEZ) waters, which may represent the current southern limit of its feeding range (CETAP 1982;

Wenzel *et al*. 1988). All of the five sightings described in the foregoing two references were in August. Yochem and Leatherwood (1985) summarized records that suggested an occurrence of this species south to Florida and the Gulf of Mexico, although the actual southern limit of the species' range is unknown. Using the U.S. Navy's SOSUS program, blue whales have been detected and tracked acoustically in much of the North Atlantic, including in subtropical waters north of the West Indies and in deep water east of the US Atlantic EEZ (Clark 1995). Most of the acoustic detections were around the Grand Banks area of Newfoundland and west of the British Isles. Sigurjónsson and Gunnlaugsson (1990) note that North Atlantic blue whales appear to have been depleted by commercial whaling to such an extent that they remain rare in some formerly important habitats, notably in the northern and northeastern North Atlantic. Little is known about the population size of blue whales except for in the Gulf of St. Lawrence area. Here, 308 individuals have been catalogued (Sears *et al*. 1987), but the data were deemed to be unusable for abundance estimation (Hammond *et al.* 1990). Mitchell (1974) estimated that the blue whale population in the western North Atlantic may number only in the low hundreds. R. Sears (pers. comm.) suggests that no present evidence exists to refute this estimate. The 308 recognizable individuals from the Gulf of St. Lawrence area which were catalogued by Sears *et al*. (1987) is considered to be a minimum population estimate for the western North Atlantic stock. The status of this stock relative to OSP in the US Atlantic EEZ is unknown, but the species is listed as endangered under the ESA. There are insufficient data to determine population trends for blue whales.

Fin Whale *(Balaenoptera physalus*)

The Scientific Committee of the International Whaling Commission (IWC) has proposed stock boundaries for North Atlantic fin whales. Fin whales off the eastern United States, Nova Scotia and the southeastern coast of Newfoundland are believed to constitute a single stock under the present IWC scheme (Donovan 1991). However, the stock identity of North Atlantic fin whales has received relatively little attention, and whether the current stock boundaries define biologically isolated units has long been uncertain. Fin whales are common in waters of the U. S. Atlantic Exclusive Economic Zone (EEZ), principally from Cape Hatteras northward. Fin whales accounted for 46% of the large whales and 24% of all cetaceans sighted over the continental shelf during aerial surveys (CETAP 1982) between Cape Hatteras and Nova Scotia during 1978-82. While much remains unknown, the magnitude of the ecological role of the fin whale is impressive. In this region fin whales are probably the dominant large cetacean species during all seasons, having the largest standing stock, the largest food requirements, and therefore the largest impact on the ecosystem of any cetacean species

(Hain *et al.* 1992; Kenney *et al.* 1997). There is little doubt that New England waters represent a major feeding ground for fin whales. There is evidence of site fidelity by females, and perhaps some segregation by sexual, maturational or reproductive class in the feeding area (Agler *et al.* 1993). Seipt *et al.* (1990) reported that 49% of fin whales sighted on the Massachusetts Bay area feeding grounds were resighted within the same year, and 45% were resighted in multiple years. Hain *et al.* (1992), based on an analysis of neonate stranding data, suggested that calving takes place during October to January in latitudes of the U.S. mid-Atlantic region; however, it is unknown where calving, mating, and wintering occurs for most of the population. Results from the Navy's SOSUS program (Clark 1995) indicate a substantial deep-ocean distribution of fin whales. It is likely that fin whales occurring in the U. S. Atlantic EEZ undergo migrations into Canadian waters, open-ocean areas, and perhaps even subtropical or tropical regions. However, the popular notion that entire fin whale populations make distinct annual migrations like some other mysticetes has questionable support in the data; in the North Pacific, year-round monitoring of fin whale calls found no evidence for large-scale migratory movements (Watkins *et al.* 2000a).

The best abundance estimate available for the western North Atlantic fin whale stock is 2,269 (CV= 0.37). This August 2006 estimate is recent and provides an estimate when the largest portion of the population was within the study area. However, this estimate must be considered extremely conservative in view of the incomplete coverage of the known habitat of the stock and the uncertainties regarding population structure and whale movements between surveyed and unsurveyed areas. The status of this stock relative to OSP in the U.S. Atlantic EEZ is unknown, but the species is listed as endangered under the ESA. There are insufficient data to determine the population trend for fin whales.

Humpback whale (*Megaptera novaeangliae*)

In the western North Atlantic, humpback whales feed during spring, summer and fall over a geographic range encompassing the eastern coast of the United States (including the Gulf of Maine), the Gulf of St. Lawrence, Newfoundland/Labrador, and western Greenland (Katona and Beard 1990). Other North Atlantic feeding grounds occur off Iceland and northern Norway, including off Bear Island and Jan Mayen (Christensen *et al.* 1992; Palsbøll *et al.* 1997). During winter, whales from most Atlantic feeding areas (including the Gulf of Maine) mate and calve in the West Indies, where spatial and genetic mixing among subpopulations occurs (Katona and Beard 1990; Clapham *et al.* 1993; Palsbøll *et al.* 1997; Stevick *et al.* 1998). The overall North Atlantic population (including the Gulf of Maine), derived from genetic

tagging data collected by the YONAH project on the breeding grounds, was estimated to be 4,894 males (95% CI=3,374-7,123) and 2,804 females (95% CI=1,776-4,463) (Palsbøll *et al.* 1997). Photographic mark-recapture analyses from the YONAH project provided an ocean-basin-wide estimate of 11,570 animals during 1992/1993 (CV=0.068, Stevick *et al.* 2003), and an additional genotype-based analysis yielded a similar but less precise estimate of 10,400 whales (CV=0.138, 95% CI=8,000 to 13,600) (Smith *et al.* 1999). In the northeastern North Atlantic, Øien (2001) estimated from sighting survey data that there were 889 (CV=0.32) humpback whales in the Barents and Norwegian Seas region. An abundance estimate of 521 (CV=0.67) humpback whales was obtained from an aerial survey conducted in July and August 2002 which covered 7,465 km of trackline over waters from the 1000 m depth contour on the southern edge of Georges Bank to Maine (Palka 2006). The value of *g(0)* used for this estimation was derived from the pooled data of 2002, 2004 and 2006 aerial survey data. An abundance estimate of 359 (CV=0.75) humpback whales was obtained from a line-transect sighting survey conducted from 12 June to 4 August 2004 by a ship and plane. The 2004 survey covered the smallest portion of the habitat (6,180 km of trackline), from the 100 m depth contour on the southern Georges Bank to the lower Bay of Fundy; while the Scotian shelf south of Nova Scotia was not surveyed. An abundance estimate of 847 animals (CV=0.55) was derived from a line-transect sighting survey conducted during August 2006 which covered 10,676 km of trackline from the 2000 m depth contour on the southern edge of Georges Bank to the upper Bay of Fundy and to the Gulf of St. Lawrence. (Palka pers. comm.) Because the Scotian shelf was surveyed in only 2006, the 25% correction factor (described above) was applied to only the 2006 abundance estimate.

The status of the North Atlantic humpback whale population was the topic of an International Whaling Commission Comprehensive Assessment in June 2001, and again in May 2002. These meetings conducted a detailed review of all aspects of the population and made recommendations for further research (IWC 2002). Although recent estimates of abundance indicate continued population growth, the size of the humpback whale stock may be below OSP in the U.S. Atlantic EEZ. This is a strategic stock because the humpback whale is listed as an endangered species under the ESA. A Recovery Plan has been published and is in effect (NMFS 1991). There are insufficient data to reliably determine current population trends for humpback whales in the North Atlantic overall. The average annual rate of population increase was estimated at 3.1% (SE=0.005, Stevick *et al.* 2003). As noted above, an analysis of demographic parameters for the Gulf of Maine (Clapham *et al.* 2003) suggested a lower rate of increase than the 6.5% reported by Barlow and Clapham (1997), but results may have been confounded by distribution shifts.

Sei Whale (*Balaenoptera borealis*)

Mitchell and Chapman (1977) reviewed the sparse evidence on stock identity of northwest Atlantic sei whales, and suggested two stocks - a Nova Scotia stock and a Labrador Sea stock. The Scientific Committee of the IWC, while adopting these general boundaries, noted that the stock identity of sei whales (and indeed all North Atlantic whales) was a major research problem (Donovan 1991). Indications are that, at least during the feeding season, a major portion of the Nova Scotia sei whale stock is centered in northerly waters, perhaps on the Scotian Shelf (Mitchell and Chapman 1977). The southern portion of the species' range during spring and summer includes the northern portions of the U.S. Atlantic Exclusive Economic Zone (EEZ) - the Gulf of Maine and Georges Bank. NMFS aerial surveys in 1999, 2000 and 2001 found concentrations of sei and right whales along the Northern Edge of Georges Bank in the spring. The sei whale is often found in the deeper waters characteristic of the continental shelf edge region (Hain *et al.* 1985), and NMFS aerial surveys found substantial numbers of sei whales in this region, south of Nantucket, in the spring of 2001. Similarly, Mitchell (1975) reported that sei whales off Nova Scotia were often distributed closer to the 2,000 m depth contour than were fin whales.

The total number of sei whales in the U.S. Atlantic EEZ is unknown. The August 2006 abundance estimate (207 CV=0.62) is considered the best available for the Nova Scotia stock of sei whales because it is the most recent. However, this estimate must be considered extremely conservative in view of the known range of the sei whale in the entire western North Atlantic, and the uncertainties regarding population structure and whale movements between surveyed and unsurveyed areas. An abundance estimate of 71 (CV=1.01) sei whales was obtained from an aerial survey conducted in August 2002 which covered 7,465 km of trackline over waters from the 1000 m depth contour on the southern edge of Georges Bank to Maine (Palka 2006). The value of *g(0)* used for this estimation was derived from the pooled data of 2002, 2004 and 2006 aerial survey data. An abundance estimate of 386 (CV=0.85) sei whales was derived from a line-transect sighting survey conducted during 12 June to 4 August 2004 by a ship and plane that surveyed 10,761 km of trackline in waters north of Maryland (38ºN)(Palka 2006). Of this, 6,180 km of trackline was within known sei whale habitat, from the 100 m depth contour on the southern Georges Bank to the lower Bay of Fundy. An abundance estimate of 207 (CV=0.62) sei whales was obtained from an aerial survey conducted in August 2006 which covered 10,676 km of trackline in the region from the 2000 m depth contour on the southern edge of Georges Bank to the upper Bay of Fundy and to the entrance of the Gulf of St. Lawrence. (Palka pers. comm.) The status of this stock relative to OSP in the U.S. Atlantic EEZ is

unknown, but the species is listed as endangered under the ESA. There are insufficient data to determine population trends for sei whales.

Bryde's Whale (*Balaenoptera edeni*)

Bryde's whales are distributed worldwide in tropical and sub-tropical waters. In the western Atlantic Ocean, Bryde's whales are reported from off the southeastern United States and the southern West Indies to Cabo Frio, Brazil (Leatherwood and Reeves 1983). Most of the sighting records of Bryde's whales in the Gulf of Mexico are from NMFS abundance surveys that were conducted during the spring (Hansen *et al.* 1995, 1996; Mullin and Hoggard 2000; Mullin and Fulling 2004). Annual cetacean surveys were conducted along a fixed plankton sampling trackline. Survey effort-weighted estimated average abundance of Bryde's whales for all surveys combined from 1991 through 1994 was 35 (CV=1.10) (Hansen *et al.* 1995). Similar surveys were conducted during spring from 1996 to 2001 (excluding 1998) in oceanic waters of the northern Gulf of Mexico. Due to limited survey effort in any given year, survey effort was pooled across all years to develop an average abundance estimate. The estimate of abundance for Bryde's whales in oceanic waters, pooled from 1996 to 2001, was 40 (CV=0.61) (Mullin and Fulling 2004). During summer 2003 and spring 2004, line-transect surveys dedicated to estimating the abundance of oceanic cetaceans were conducted in the northern Gulf of Mexico. During each year, a grid of uniformly-spaced transect lines from a random start were surveyed from the 200-m isobath to the seaward extent of the U.S. EEZ using NOAA Ship *Gordon Gunter* (Mullin 2007). The estimate of abundance for Bryde's whales in oceanic waters, pooled from 2003 to 2004, was 15 (CV=1.98) (Mullin 2007), which is the best available abundance estimate for this species in the northern Gulf of Mexico. The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normal distributed abundance estimate. This is equivalent to the 20th percentile of the log-normal distributed abundance estimate as specified by Wade and Angliss (1997). The best estimate of abundance for Bryde's whales is 15 (CV=1.98). The minimum population estimate for the northern Gulf of Mexico is 5 Bryde's whales. The status of Bryde's whales in the northern Gulf of Mexico, relative to OSP, is unknown. The species is not listed as threatened or endangered under the Endangered Species Act. There are insufficient data to determine the population trends for this species.

Minke Whale (*Balaenoptera acutorostrata*)

Minke whales have a cosmopolitan distribution, being distributed in polar, temperate and tropical waters. In the North Atlantic, there are four recognized populations — Canadian East Coast, west Greenland, central

North Atlantic, and northeastern North Atlantic (Donovan 1991). The minke whale is common and widely distributed within the U.S. Atlantic Exclusive Economic Zone (EEZ) (CETAP 1982). There appears to be a strong seasonal component to minke whale distribution. Spring and summer are times of relatively widespread and common occurrence, and when the whales are most abundant in New England waters. During fall in New England waters, there are fewer minke whales, while during winter, the species appears to be largely absent. Like most other baleen whales, minke whales generally occupy the continental shelf proper, rather than the continental shelf edge region. Records summarized by Mitchell (1991) hint at a possible winter distribution in the West Indies, and in the mid-ocean south and east of Bermuda. As with several other cetacean species, the possibility of a deep-ocean component to the distribution of minke whales exists but remains unconfirmed. The total number of minke whales in the Canadian East Coast population is unknown. However, ten estimates are available for portions of the habitat: a 1978-1982 estimate; a shipboard survey estimate from the summers of 1991 and 1992; a shipboard estimate from June and July 1993; an estimate made from a combination of shipboard and aerial surveys conducted during July to September 1995; an aerial survey estimate of the entire Gulf of St. Lawrence conducted in August to September 1995; an aerial survey estimate from the northern Gulf of St. Lawrence conducted during July and August 1996; an aerial/shipboard survey conducted from Georges Bank to the mouth of the Gulf of St. Lawrence during July and August 1999; and aerial surveys conducted during the summers of 2002, 2004, and 2006. The best available current abundance estimate for minke whales, 3,312 (CV=0.74), is obtained from the 2006 aerial survey because this survey is recent and covered the largest portion of the animal's habitat. The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normally distributed best abundance estimate. This is equivalent to the 20th percentile of the log-normal distribution as specified by Wade and Angliss (1997). The best estimate of abundance for minke whales is 3,312 animals (CV=0.74). The minimum population estimate for the Canadian East Coast minke whale is 1,899 animals. The status of minke whales, relative to OSP, in the U.S. Atlantic EEZ is unknown. The minke whale is not listed as endangered under the Endangered Species Act (ESA).

Sperm Whale (*Physeter macrocephalus*)

Sperm whales are found throughout the world's oceans in deep waters to the edge of the ice at both poles (Leatherwood and Reeves 1983; Rice 1989; Whitehead 2002).

Gulf of Mexico In the northern Gulf of Mexico systematic aerial and ship

surveys indicate that sperm whales inhabit only waters greater than 200 m deep where they are widely distributed (Fulling *et al.* 2003, Mullin *et al*. 2004, Mullin and Fulling 2004, Mullin 2007). Seasonal aerial surveys confirm that sperm whales are present in the northern Gulf of Mexico in all seasons (Mullin *et al.* 1994; Hansen *et al.* 1996; Mullin and Hoggard 2000). The information for southern Gulf of Mexico waters is more limited, but there are sighting and stranding records from each season with sightings widely distributed in continental slope waters of the western Bay of Campeche (Ortega-Ortiz 2002). Estimates of abundance were derived through the application of distance sampling analysis (Buckland *et al.* 2001) and the computer program DISTANCE (Thomas *et al.* 1998) to sighting data. Annual cetacean surveys were conducted along a fixed plankton sampling trackline. Survey effort-weighted estimated average abundance of sperm whales for all surveys combined was 530 (CV=0.31) (Hansen *et al.* 1995). Similar surveys were conducted during spring from 1996 to 2001 (excluding 1998) in oceanic waters of the northern Gulf of Mexico. Due to limited survey effort in any given year, survey effort was pooled across all years to develop an average abundance estimate. The estimate of abundance for sperm whales in oceanic waters, pooled from 1996 to 2001, is 1,349 (CV=0.23) (Mullin and Fulling 2004). The estimate of abundance for sperm whales in oceanic waters, pooled from 2003 to 2004, was 1,665 (CV=0.20) (Mullin 2007), which is the best available abundance estimate for this species in the northern Gulf of Mexico. The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normal distributed abundance estimate. This is equivalent to the 20th percentile of the log-normal distributed abundance estimate as specified by Wade and Angliss (1997). The best estimate of abundance for sperm whales is 1,665 (CV=0.20). The minimum population estimate for the northern Gulf of Mexico is 1,409 sperm whales. The status of sperm whales in the northern Gulf of Mexico, relative to OSP, is unknown. This species is listed as endangered under the Endangered Species Act (ESA). There are insufficient data to determine the population trends for this species.

North Atlantic In the U.S. Atlantic EEZ waters, there appears to be a distinct seasonal cycle (CETAP 1982; Scott and Sadove 1997). The best recent abundance estimate for sperm whales is the sum of the estimates from the two 2004 U.S. Atlantic surveys, 4,804 (CV=0.38), where the estimate from the northern U.S. Atlantic is 2,607 (CV=0.57), and from the southern U.S. Atlantic is 2,197 (CV=0.47). An abundance of 2,607 (CV=0.57) for sperm whales was estimated from a line-transect sighting survey conducted during 12 June to 4 August 2004 by a ship and plane that surveyed 10,761 km of track line in waters north of Maryland (about 38ºN) to the Bay of Fundy (about 45ºN) (Palka 2006). The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the

log-normally distributed best abundance estimate. This is equivalent to the 20th percentile of the log-normal distribution as specified by Wade and Angliss (1997). The best estimate of abundance for sperm whales is 4,804 (CV=0.38). The minimum population estimate for the western North Atlantic sperm whale is 3,539. The status of this stock relative to OSP in U.S. Atlantic EEZ is unknown, but the species is listed as endangered under the ESA. There are insufficient data to determine population trends.

Killer Whale (*Orcinus orca*)
The killer whale is distributed worldwide from tropical to polar regions (Leatherwood and Reeves 1983).

Gulf of Mexico Sightings of these animals in the northern Gulf of Mexico during 1951-1995 occurred primarily in oceanic waters ranging from 256 to 2,652 m (averaging 1,242 m) in the north-central Gulf of Mexico (O'Sullivan and Mullin 1997). Annual cetacean surveys were conducted along a fixed plankton sampling trackline. Survey effort-weighted estimated average abundance of killer whales for all surveys combined was 277 (CV=0.42) (Hansen *et al.* 1995). Similar surveys were conducted during spring from 1996 to 2001 (excluding 1998) in oceanic waters of the northern Gulf of Mexico. Due to limited survey effort in any given year, survey effort was pooled across all years to develop an average abundance estimate. The estimate of abundance for killer whales in oceanic waters, pooled from 1996 to 2001, was 133 (CV=0.49) (Mullin and Fulling 2004). The estimate of abundance for killer whales in oceanic waters, pooled from 2003 to 2004, was 49 (CV=0.77) (Mullin 2007), which is the best available abundance estimate for this species in the northern Gulf of Mexico. The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normal distributed abundance estimate. This is equivalent to the 20th percentile of the log-normal distributed abundance estimate as specified by Wade and Angliss (1997). The best estimate of abundance for killer whales is 49 (CV=0.77). The minimum population estimate for the northern Gulf of Mexico is 28 killer whales. The status of killer whales in the northern Gulf of Mexico, relative to OSP, is unknown. The species is not listed as 252 threatened or endangered under the Endangered Species Act. There are insufficient data to determine the population trends for this species.

Western North Atlantic Killer whales are characterized as uncommon or rare in waters of the U.S. Atlantic Exclusive Economic Zone (EEZ) (Katona *et al*. 1988). The 12 killer whale sightings constituted 0.1% of the 11,156 cetacean sightings in the 1978-81 CETAP surveys (CETAP 1982). The same is true for eastern Canadian waters, where the species has been described as relatively uncommon and numerically few (Mitchell and Reeves 1988).

Their distribution, however, extends from the Arctic ice-edge to the West Indies. They are normally found in small groups, although 40 animals were reported from the southern Gulf of Maine in September 1979, and 29 animals in Massachusetts Bay in August 1986 (Katona *et al*. 1988). In the U.S. Atlantic EEZ, while their occurrence is unpredictable, they do occur in fishing areas, perhaps coincident with tuna, in warm seasons (Katona *et al*. 1988; NMFS unpublished data). The total number of killer whales off the eastern U.S. coast is unknown. The status of killer whales relative to OSP in U.S. Atlantic EEZ is unknown.

Short-finned Pilot Whale (*Globicephala macrorhynchus*)

The short-finned pilot whale is distributed worldwide in tropical to warm temperate waters (Leatherwood and Reeves 1983). The species is not listed as threatened or endangered under the Endangered Species Act. There are insufficient data to determine the population trends for this species.

Gulf of Mexico Sightings of these animals in the northern Gulf of Mexico occur primarily on the continental slope (Mullin and Fulling 2004). Short-finned pilot whales were seen in all seasons during GulfCet aerial surveys of the northern Gulf of Mexico between 1992 and 1998 (Hansen *et al.* 1996; Mullin and Hoggard 2000). Annual cetacean surveys were conducted along a fixed plankton sampling trackline. Survey effort-weighted estimated average abundance of short-finned pilot whales for all surveys combined was 353 (CV=0.89) (Hansen *et al.* 1995). Similar surveys were conducted during spring from 1996 to 2001 (excluding 1998) in oceanic waters of the northern Gulf of Mexico. Due to limited survey effort in any given year, survey effort was pooled across all years to develop an average abundance estimate. The estimate of abundance for short-finned pilot whales in oceanic waters, pooled from 1996 to 2001, was 2,388 (CV=0.48) (Mullin and Fulling 2004). During summer 2003 and spring 2004, line-transect surveys dedicated to estimating the abundance of oceanic cetaceans were conducted in the northern Gulf of Mexico. The estimate of abundance for short-finned pilot whales in oceanic waters, pooled from 2003 to 2004, was 716 (CV=0.34) (Mullin 2007), which is the best available abundance estimate for this species in the northern Gulf of Mexico. The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normal distributed abundance estimate. This is equivalent to the 20th percentile of the log-normal distributed abundance estimate as specified by Wade and Angliss (1997). The best estimate of abundance for short-finned pilot whales is 716 (CV=0.34). The minimum population estimate for the northern Gulf of Mexico is 542 short-finned pilot whales. The status of short-finned pilot whales in the northern Gulf of Mexico, relative to OSP, is unknown.

Western North Atlantic Sightings of these animals in the U.S. Atlantic EEZ occur in oceanic waters (Mullin and Fulling 2003) and along the continental shelf and continental slope in the northern Gulf of Mexico (Hansen *et al.* 1996; Mullin and Hoggard 2000; Mullin and Fulling 2003). The total number of short-finned pilot whales off the eastern U.S. and Canadian Atlantic coast is unknown, although several abundance estimates are available from selected regions for select time periods. Sightings were almost exclusively in the continental shelf edge and continental slope areas. The best abundance estimate for *Globicephala* sp. is the sum of the estimates from the two 2004 U.S. Atlantic surveys. This joint estimate (15,728 + 15,411 = 31,139 whales) is considered best because these two surveys together have the most complete coverage of the species' habitat. The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normally distributed best abundance estimate. This is equivalent to the 20th percentile of the log-normal distribution as specified by Wade and Angliss (1997). The best estimate of abundance for *Globicephala* sp. is 31,139 animals (CV=0.27) derived from the 2004 surveys. The minimum population estimate for *Globicephala* sp. is 24,866. The status of short-finned pilot whales relative to OSP in the U.S. Atlantic EEZ is unknown.

Long-Finned Pilot Whale (*Globicephala melas*)

The long-finned pilot whale is distributed from North Carolina to North Africa (and the Mediterranean) and north to Iceland, Greenland and the Barents Sea (Sergeant 1962; Leatherwood *et al.* 1976; Abend 1993; Buckland *et al.* 1993; Abend and Smith 1999). The stock structure of the North Atlantic population is uncertain (ICES 1993; Fullard *et al.* 2000). The total number of long-finned pilot whales off the eastern U.S. and Canadian Atlantic coast is unknown, although several abundance estimates are available from selected regions for select time periods. Sightings were almost exclusively in the continental shelf edge and continental slope areas. This joint estimate (15,728 (CV=0.34) + 15,411 (CV=0.43) = 31,139 (CV=0.27) whales) is considered best because these two surveys together have the most complete coverage of the species' habitat. The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the lognormally distributed best abundance estimate. This is equivalent to the 20th percentile of the log-normal distribution as specified by (Wade and Angliss 1997). The best estimate of abundance for *Globicephala* sp. is 31,139 animals (CV=0.27) derived from the 2004 surveys. The minimum population estimate for *Globicephala* sp. is 24,866. The status of long-finned pilot whales relative to OSP in U.S. Atlantic EEZ is unknown. There are insufficient data to determine population trends for this species. The species is not listed under the Endangered Species Act.

Melon-headed Whale (*Peponocephala electra*)
The melon-headed whale is distributed worldwide in tropical to sub-tropical waters (Jefferson *et al.* 1994).

Gulf of Mexico Sightings in the northern Gulf of Mexico occur in oceanic waters (Mullin *et al.* 1994; Mullin and Fulling 2004). Sightings of melonheaded whales were documented in all seasons during GulfCet aerial surveys of the northern Gulf of Mexico between 1992 and 1998 (Hansen *et al.* 1996; Mullin and Hoggard 2000). Annual cetacean surveys were conducted along a fixed plankton sampling trackline. Survey effort-weighted estimated average abundance of melon-headed whales for all surveys combined was 3,965 (CV=0.39) (Hansen *et al.* 1995). Similar surveys were conducted during spring from 1996 to 2001 (excluding 1998) in oceanic waters of the northern Gulf of Mexico. Due to limited survey effort in any given year, survey effort was pooled across all years to develop an average abundance estimate. The estimate of abundance for melon-headed whales in oceanic waters, pooled from 1996 to 2001, was 3,451 (CV=0.55) (Mullin and Fulling 2004). The estimate of abundance for melon-headed whales in oceanic waters, pooled from 2003 to 2004, was 2,283 (CV=0.76) (Mullin 2007), which is the best available abundance estimate for this species in the northern Gulf of Mexico. The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normal distributed abundance estimate. This is equivalent to the 20th percentile of the log-normal distributed abundance estimate as specified by Wade and Angliss (1997). The best estimate of abundance for melon-headed whales is 2,283 (CV=0.76). The minimum population estimate for the northern Gulf of Mexico is 1,293 melon-headed whales. The status of melon-headed whales in the northern Gulf of Mexico, relative to OSP, is unknown. The species is not listed as threatened or endangered under the Endangered Species Act.

False Killer Whale (*Pseudorca crassidens*)
The false killer whale is distributed worldwide throughout warm temperate and tropical oceans (Leatherwood and Reeves 1983). Sightings of this species in the northern Gulf of Mexico occur in oceanic waters (Figure 1; Mullin and Fulling 2004). False killer whales were seen only in the spring and summer during GulfCet aerial surveys of the northern Gulf of Mexico between 1992 and 1998 (Hansen *et al.* 1996; Mullin and Hoggard 2000) and in the spring during vessel surveys (Mullin and Fulling 2004). Annual cetacean surveys were conducted along a fixed plankton sampling trackline. Survey effort-weighted estimated average abundance of false killer whales for all surveys combined was 381 (CV=0.62) (Hansen *et al.* 1995). Similar surveys were conducted during spring from 1996 to 2001 (excluding 1998)

in oceanic waters of the northern Gulf of Mexico. Due to limited survey effort in any given year, survey effort was pooled across all years to develop an average abundance estimate. The estimate of abundance for false killer whales in oceanic waters, pooled from 1996 to 2001, was 1,038 (CV=0.71) (Mullin and Fulling 2004). The estimate of abundance for false killer whales in oceanic waters, pooled from 2003 to 2004, was 777 (CV=0.56) (Mullin 2007), which is the best available abundance estimate for this species in the northern Gulf of Mexico. The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normal distributed abundance estimate. This is equivalent to the 20th percentile of the log-normal distributed abundance estimate as specified by Wade and Angliss (1997). The best estimate of abundance for false killer whales is 777 (CV=0.56). The minimum population estimate for the northern Gulf of Mexico is 501 false killer whales. The status of false killer whales in the northern Gulf of Mexico, relative to OSP, is unknown. The species is not listed as threatened or endangered under the Endangered Species Act. There are insufficient data to determine the population trends for this species.

Pygmy Killer Whale (*Feresa attenuata*)

The pygmy killer whale is distributed worldwide in tropical and subtropical waters (Ross and Leatherwood 1994). Sightings of these animals in the northern Gulf of Mexico occur in oceanic waters (Mullin and Fulling 2004). Sightings of pygmy killer whales were documented in all seasons during GulfCet aerial surveys of the northern Gulf of Mexico between 1992 and 1998 (Hansen *et al.* 1996; Mullin and Hoggard 2000). Annual cetacean surveys were conducted along a fixed plankton sampling trackline. Survey effort-weighted estimated average abundance of pygmy killer whales for all surveys combined was 518 (CV=0.81) (Hansen *et al.* 1995).\ Similar surveys were conducted during spring from 1996 to 2001 (excluding 1998) in oceanic waters of the northern Gulf of Mexico. Due to limited survey effort in any given year, survey effort was pooled across all years to develop an average abundance estimate. The estimate of abundance for pygmy killer whales in oceanic waters, pooled from 1996 to 2001, was 408 (CV=0.60) (Mullin and Fulling 2004). The estimate of abundance for pygmy killer whales in oceanic waters, pooled from 2003 to 2004, was 323 (CV=0.60) (Mullin 2007), which is the best available abundance estimate for this species in the northern Gulf of Mexico. The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normal distributed abundance estimate. This is equivalent to the 20th percentile of the log-normal distributed abundance estimate as specified by Wade and Angliss (1997). The best estimate of abundance for pygmy killer whales is 323 (CV=0.60). The minimum population estimate for the northern Gulf of Mexico is 203 pygmy killer whales. The status of pygmy killer whales in the

northern Gulf of Mexico, relative to OSP, is unknown. The species is not listed as threatened or endangered under the Endangered Species Act. There are insufficient data to determine the population trends for this species.

Dwarf Sperm Whale (*Kogia sima*)

The dwarf sperm whale appears to be distributed worldwide in temperate to tropical waters (Caldwell and Caldwell 1989). Sightings of these animals in the northern Gulf of Mexico occur primarily in oceanic waters (Figure 1; Mullin *et al.* 1991; Mullin and Fulling 2004). Annual cetacean surveys were conducted along a fixed plankton sampling trackline. Survey effort-weighted estimated average abundance of dwarf and pygmy sperm whales for all surveys combined was 547 (CV=0.28) (Hansen *et al.* 1995). Similar surveys were conducted during spring from 1996 to 2001 (excluding 1998) in oceanic waters of the northern Gulf of Mexico. Due to limited survey effort in any given year, survey effort was pooled across all years to develop an average abundance estimate. The estimate of abundance for dwarf and pygmy sperm whales in oceanic waters, pooled from 1996 to 2001, was 742 (CV=0.29) (Mullin and Fulling 2004). The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normal distributed abundance estimate. This is equivalent to the 20th percentile of the log-normal distributed abundance estimate as specified by Wade and Angliss (1997). The best estimate of abundance for dwarf and pygmy sperm whales is 453 (CV=0.35). It is not possible to determine the minimum population estimate for only dwarf sperm whales. The minimum population estimate for the northern Gulf of Mexico is 340 dwarf and pygmy sperm whales. The status of dwarf sperm whales in the northern Gulf of Mexico, relative to OSP, is unknown. The species is not listed as threatened or endangered under the Endangered Species Act. There are insufficient data to determine the population trends for this species.

Pygmy Sperm Whale (*Kogia breviceps*)

The pygmy sperm whale appears to be distributed worldwide in temperate to tropical waters (Caldwell and Caldwell 1989). Annual cetacean surveys were conducted along a fixed plankton sampling trackline. Survey effort-weighted estimated average abundance of pygmy and dwarf sperm whales for all surveys combined was 547 (CV=0.28) (Hansen *et al.* 1995). Similar surveys were conducted during spring from 1996 to 2001 (excluding 1998) in oceanic waters of the northern Gulf of Mexico. Due to limited survey effort in any given year, survey effort was pooled across all years to develop an average abundance estimate. The estimate of abundance for pygmy and dwarf sperm whales in oceanic waters, pooled from 1996 to 2001, was 742 (CV=0.29) (Mullin and Fulling 2004). A separate estimate of abundance for

pygmy sperm whales could not be estimated due to uncertainty of species identification at sea. The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normal distributed abundance estimate. This is equivalent to the 20th percentile of the log-normal distributed abundance estimate as specified by Wade and Angliss (1997). The best estimate of abundance for pygmy and dwarf sperm whales is 453 (CV=0.35). It is not possible to determine the minimum population estimate for only pygmy sperm whales. The minimum population estimate for the northern Gulf of Mexico is 340 pygmy and dwarf sperm whales. The status of pygmy sperm whales in the northern Gulf of Mexico, relative to OSP, is unknown. The species is not listed as threatened or endangered under the Endangered Species Act. There are insufficient data to determine the population trends for this species.

Northern Bottlenose Whale (*Hyperoodon ampullatus*)

Northern bottlenose whales are characterized as extremely uncommon or rare in waters of the U.S. Atlantic Exclusive Economic Zone. The two sightings of three individuals constituted less than 0.1% of the 11,156 cetacean sightings in the 1978-82 CETAP surveys. Both sightings were in the spring, along the 2,000-m isobath (CETAP 1982). Northern bottlenose whales are distributed in the North Atlantic from Nova Scotia to about 70º in the Davis Strait, along the east coast of Greenland to 77º and from England to the west coast of Spitzbergen. It is largely a deep-water species and is very seldom found in waters less than 2,000 m deep (Mead 1989). The total number of northern bottlenose whales off the eastern U.S. coast is unknown. Present data are insufficient to calculate a minimum population estimate. The status of northern bottlenose whales relative to OSP in U.S. Atlantic EEZ is unknown; however, the depletion in Canadian waters in the 1970s may have impacted U.S. distribution and may be relevant to current status in U.S. waters. This species is not listed as threatened or endangered under the U.S. Endangered Species Act. There are insufficient data to determine population trends for this species.

Risso's Dolphin (*Grampus griseus*)

Risso's dolphins are distributed worldwide in tropical and temperate seas, and in the Northwest Atlantic occur from Florida to eastern Newfoundland (Leatherwood *et al.* 1976; Baird and Stacey 1990). The species is not listed as threatened or endangered under the Endangered Species Act. There are insufficient data to determine population trends for this species.

Gulf of Mexico Risso's dolphins in the northern Gulf of Mexico occur throughout oceanic waters but are concentrated in continental slope waters

(Baumgartner 1997). Risso's dolphins were seen in all seasons during GulfCet aerial surveys of the northern Gulf of Mexico between 1992 and 1998 (Hansen *et al.* 1996; Mullin and Hoggard 2000). Annual cetacean surveys were conducted along a fixed plankton sampling trackline. Survey effort-weighted estimated average abundance of Risso's dolphins for all surveys combined was 2,749 (CV=0.27) (Hansen *et al.* 1995). Similar surveys were conducted during spring from 1996 to 2001 (excluding 1998) in oceanic waters of the northern Gulf of Mexico. Due to limited survey effort in any given year, survey effort was pooled across all years to develop an average abundance estimate. The estimate of abundance for Risso's dolphins in oceanic waters, pooled from 1996 to 2001, was 2,169 (CV=0.32) (Mullin and Fulling 2004). The estimate of abundance for Risso's dolphins in oceanic waters, pooled from 2003 to 2004, was 1,589 (CV=0.27) (Mullin 2007), which is the best available abundance estimate for this species in the northern Gulf of Mexico. The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normal distributed abundance estimate. This is equivalent to the 20th percentile of the log-normal distributed abundance estimate as specified by Wade and Angliss (1997). The best estimate of abundance for Risso's dolphins is 1,589 (CV=0.27). The minimum population estimate for the northern Gulf of Mexico is 1,271 Risso's dolphins. The status of Risso's dolphins in the northern Gulf of Mexico, relative to OSP, is unknown.

Western North Atlantic Off the northeast U.S. coast, Risso's dolphins are distributed along the continental shelf edge from Cape Hatteras northward to Georges Bank during spring, summer, and autumn (CETAP 1982; Payne *et al.* 1984). Total numbers of Risso's dolphins off the U.S. or Canadian Atlantic coast are unknown, although eight abundance estimates are available from selected regions for select time periods. Sightings were almost exclusively in the continental shelf edge and continental slope areas. The best abundance estimate for Risso's dolphins is the sum of the estimates from the two 2004 U.S. Atlantic surveys, 20,479 (CV=0.59), where the estimate from the northern U.S. Atlantic is 15.053 (CV=0.78), and from the southern U.S. Atlantic is 5,426 (CV=0.54). This joint estimate is considered best because these two surveys together have the most complete coverage of the population's habitat. The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normally distributed best abundance estimate. This is equivalent to the 20th percentile of the log-normal distribution as specified by Wade and Angliss (1997). The best estimate of abundance for Risso's dolphins is 20,479 (CV=0.59), obtained from the 2004 surveys. The minimum population estimate for the western North Atlantic Risso's dolphin is 12,920. The status of Risso's dolphins relative to OSP in the U.S. Atlantic EEZ is unknown.

Short-beaked Common Dolphin (*Delphinus delphis*)

The common dolphin may be one of the most widely distributed species of cetaceans, as it is found world-wide in temperate, tropical, and subtropical seas. In the North Atlantic, common dolphins occur over the continental shelf along the 200-2000 m isobaths and over prominent underwater topography from 50º N to 40º S latitude (Evans 1994). The total number of common dolphins off the U.S. or Canadian Atlantic coast is unknown, although several abundance estimates are available from selected regions for selected time periods. The best abundance estimate for common dolphins is 120,743 animals (CV= 0.23). This is the sum of the estimates from two 2004 U.S. Atlantic surveys, where the estimate from the northern U.S. Atlantic is 90,547 (CV=0.24), and from the southern U.S. Atlantic is 30,196 (CV=0.54). This joint estimate is considered best because the two surveys together have the most complete coverage of the species' habitat. The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normally distributed best abundance estimate. This is equivalent to the 20th percentile of the log-normal distribution as specified by Wade and Angliss (1997). The best estimate of abundance for common dolphins is 120,743 animals (CV=0.23) derived from the 2004 surveys. The minimum population estimate for the western North Atlantic common dolphin is 99,975. The status of short-beaked common dolphins, relative to OSP, in the U.S. Atlantic EEZ is unknown. The species is not listed as threatened or endangered under the Endangered Species Act. There are insufficient data to determine the population trends for this species.

Atlantic White-Sided Dolphin (*Lagenorhynchus obliquidens*)

White-sided dolphins are found in temperate and sub-polar waters of the North Atlantic, primarily in continental shelf waters to the 100-m depth contour. The species is not listed as threatened or endangered under the Endangered Species Act. There are insufficient data to determine population trends for this species. The species inhabits waters from central West Greenland to North Carolina (about 35°N) and perhaps as far east as 43°W (Evans 1987; Hamazaki 2002). Distribution of sightings, strandings and incidental takes suggest the possible existence of three stock units: Gulf of Maine, Gulf of St. Lawrence and Labrador Sea stocks (Palka *et al.* 1997). The total number of white-sided dolphins along the eastern U.S. and Canadian Atlantic coast is unknown, although eight estimates from select regions are available from: 1) spring, summer and autumn 1978-1982; 2) July-September 1991-1992; 3) June-July 1993; 4) July-September 1995; 5) July-August 1999; 6) August 2002; 7) June- July 2004; and 8) August 2006. The best available current abundance estimate for white-sided dolphins in the western North Atlantic stock is 63,368 (CV=0.27), an average of the surveys

conducted in August within the last 8 years (2002 and 2006). The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normally distributed best abundance estimate. This is equivalent to the 20th percentile of the log-normal distribution as specified by (Wade and Angliss 1997). The best estimate of abundance for the western North Atlantic stock of white-sided dolphins is 63,368 (CV=0.27). The minimum population estimate for these white-sided dolphins is 50,883. The status of white-sided dolphins, relative to OSP, in the U.S. Atlantic EEZ is unknown.

Rough-Toothed Dolphin (*Steno bredanensis*)

The distribution of the rough-toothed dolphin (*Steno bredanensis*) is poorly understood worldwide. For management purposes, rough-toothed dolphins observed off the eastern U.S. coast are provisionally considered a separate stock from dolphins recorded in the northern Gulf of Mexico, although there is currently no information to differentiate these stock(s). The species is not listed as threatened or endangered under the Endangered Species Act. There are insufficient data to determine the population size or trends and PBR cannot be calculated for this stock.

Gulf of Mexico Rough-toothed dolphins were seen in all seasons during GulfCet aerial surveys of the northern Gulf of Mexico between 1992 and 1998 (Hansen *et al.* 1996; Mullin and Hoggard 2000). Annual cetacean surveys were conducted along a fixed plankton sampling trackline. Survey effort-weighted estimated average abundance of rough-toothed dolphins for all surveys combined was 852 (CV= 0.31) (Hansen *et al.* 1995). This was probably an underestimate and should be considered a partial stock estimate because the continental shelf area was not entirely covered. Similar surveys were conducted during spring from 1996 to 2001 (excluding 1998) in oceanic waters of the northern Gulf of Mexico from 200 m to the offshore extent of the U.S. EEZ. Estimates for all oceanic strata were summed, as survey effort was not uniformly distributed, to calculate a total estimate for the entire northern Gulf of Mexico oceanic waters (Mullin and Fulling 2004). Due to limited survey effort in any given year, survey effort was pooled across all years to develop an average abundance estimate for both continental shelf and oceanic waters. The estimate of abundance for rough-toothed dolphins in oceanic waters, pooled from 1996 through 2001, was 985 (CV=0.44) (Mullin and Fulling 2004). The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normal distributed abundance estimate. This is equivalent to the 20th percentile of the log-normal distributed abundance estimate as specified by Wade and Angliss (1997). The best estimate of abundance for rough-toothed dolphins is 2,653 (CV=0.42). The minimum population estimate for the northern Gulf

of Mexico is 1,890 rough-toothed dolphins. The status of rough-toothed dolphins in the northern Gulf of Mexico, relative to OSP, is unknown.

Western North Atlantic These dolphins are typically seen in small groups of 10-20 animals (Wade and Gerrodette 1993; Jefferson 2002; Reeves *et al.* 2003; Waring *et al.* 2007) . Larger groups have been recorded, namely groups of 45 animals in the Atlantic (CETAP 1982), over 50 animals in the eastern tropical Pacific, 99 animals in the Caribbean (Swartz *et al.* 2001), 160 animals in the Mediterranean, and 300 animals off Hawaii (Miyazaki and Perrin 1994). The number of rough-toothed dolphins off the eastern U.S. and Canadian Atlantic coast is unknown, and seasonal abundance estimates are not available for this stock, since it was rarely seen during surveys. Present data are insufficient to calculate a minimum population estimate for this stock. The status of rough-toothed dolphins relative to OSP in the U.S. Atlantic EEZ is unknown.

Striped Dolphin (*Stenella coeruleoalba*)

The striped dolphin is distributed worldwide in tropical to temperate oceanic waters (Leatherwood and Reeves 1983; Perrin *et al.* 1994d). The species is not listed as threatened or endangered under the Endangered Species Act. There are insufficient data to determine the population trends for this species.

Gulf of Mexico Sightings of these animals in the northern Gulf of Mexico occur in oceanic waters (Mullin and Fulling 2004). Striped dolphins were seen in all seasons during GulfCet aerial surveys of the northern Gulf of Mexico between 1992 and 1998 (Hansen *et al.* 1996; Mullin and Hoggard 2000). Annual cetacean surveys were conducted along a fixed plankton sampling trackline. Survey effort-weighted estimated average abundance of striped dolphins for all surveys combined was 4,858 (CV=0.44) (Hansen *et al.* 1995). The estimate of abundance for striped dolphins in oceanic waters, pooled from 1996 to 2001, was 6,505 (CV=0.43) (Mullin and Fulling 2004). The estimate of abundance for striped dolphins in oceanic waters, pooled from 2003 to 2004, was 3,325 (CV=0.48) (Mullin 2007), which is the best available abundance estimate for this species in the northern Gulf of Mexico. The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normal distributed abundance estimate. This is equivalent to the 20th percentile of the log-normal distributed abundance estimate as specified by Wade and Angliss (1997). The best estimate of abundance for striped dolphins is 3,325 (CV=0.48). The minimum population estimate for the northern Gulf of Mexico is 2,266 striped dolphins. The status of striped dolphins in the northern Gulf of Mexico, relative to OSP, is unknown.

Western North Atlantic Striped dolphins are found in the western North Atlantic from Nova Scotia south to at least Jamaica and in the Gulf of Mexico. Total numbers of striped dolphins off the U.S. or Canadian Atlantic coast are unknown, although several estimates from selected regions are available for select time periods. Sightings are almost exclusively in the continental shelf edge and continental slope areas west of Georges Bank. The best abundance estimate for striped dolphins is the sum of the estimates from the two 2004 U.S. Atlantic surveys, 94,462 (CV=0.40), where the estimate from the northern U.S. Atlantic is 52,055 (CV=0.57), and from the southern U.S. Atlantic is 42,407 (CV=0.53). This joint estimate is considered best because together these two surveys have the most complete coverage of the species' habitat. The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normally distributed best abundance estimate. This is equivalent to the 20th percentile of the log-normal distribution as specified by Wade and Angliss (1997). The best estimate of abundance for striped dolphins is 94,462 (CV=0.40) obtained from the 2004 surveys. The minimum population estimate for the western North Atlantic striped dolphin is 68,558. The status of striped dolphins, relative to OSP, in the U.S. Atlantic EEZ is unknown.

Pantropical Spotted Dolphin (*Stenella attenuata*)

The pantropical spotted dolphin is distributed worldwide in tropical and some sub-tropical oceans (Perrin *et al.* 1987; Perrin and Hohn 1994a). The species is not listed as threatened or endangered under the Endangered Species Act. There are insufficient data to determine the population trends for this species.

Gulf of Mexico Annual cetacean surveys were conducted along a fixed plankton sampling trackline. Survey effort-weighted estimated average abundance of pantropical spotted dolphins for all surveys combined was 31,320 (CV=0.20) (Hansen *et al.* 1995). Similar surveys were conducted during spring from 1996 to 2001 (excluding 1998) in oceanic waters of the northern Gulf of Mexico. Due to limited survey effort in any given year, survey effort was pooled across all years to develop an average abundance estimate. The estimate of abundance for pantropical spotted dolphins in oceanic waters, pooled from 1996 to 2001, was 91,321 (CV=0.16) (Mullin and Fulling 2004). The estimate of abundance for pantropical spotted dolphins in oceanic waters, pooled from 2003 to 2004, was 34,067 (CV=0.18) (Mullin 2007), which is the best available abundance estimate for this species in the northern Gulf of Mexico. The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normal distributed abundance estimate. This is equivalent to the 20th

percentile of the log-normal distributed abundance estimate as specified by Wade and Angliss (1997). The best estimate of abundance for pantropical spotted dolphins is 34,067 (CV=0.18). The minimum population estimate for the northern Gulf of Mexico is 29,311 pantropical spotted dolphins. The status of pantropical spotted dolphins in the northern Gulf of Mexico, relative to OSP, is unknown.

Western North Atlantic There are two species of spotted dolphin in the Atlantic Ocean, the Atlantic spotted dolphin, *Stenella frontalis,* formerly *S. plagiodon*, and the pantropical spotted dolphin, *S. attenuata* (Perrin *et al.* 1987). Total numbers of pantropical spotted dolphins off the U.S. or Canadian Atlantic coast are unknown, although estimates are available from selected regions for select time periods. Sightings have been concentrated in the slope waters north of Cape Hatteras, but in the shelf waters south of Cape Hatteras sightings extend into the deeper slope and offshore waters of the mid-Atlantic. The best recent abundance estimate for pantropical spotted dolphins is the sum of the estimates from the two 2004 western U.S. Atlantic surveys. This joint estimate (0+4,439=4,439) is considered best because these two surveys together have the most complete coverage of the species' habitat. The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normally distributed best abundance estimate. This is equivalent to the 20th percentile of the log-normal distribution as specified by Wade and Angliss (1997). The best estimate of abundance for pantropical spotted dolphins is 4,439 (CV=0. 49). The minimum population estimate for pantropical spotted dolphins is 3,010. The status of pantropical spotted dolphins, relative to OSP in the western U.S. Atlantic EEZ is unknown.

Atlantic Spotted Dolphin (*Stenella frontalis*)

The Atlantic spotted dolphin is endemic to the Atlantic Ocean in temperate to tropical waters (Perrin *et al.* 1987, 1994). The species is not listed as threatened or endangered under the Endangered Species Act. There are insufficient data to determine the population trends for this species.

Gulf of Mexico Survey effort-weighted estimated average abundance of Atlantic spotted dolphins for all surveys combined was 3,213 (CV=0.44) (Hansen *et al.* 1995). The best available abundance estimate for the Atlantic spotted dolphin in the northern Gulf of Mexico is the combined estimate of abundance for both the outer continental shelf (fall surveys, 2000-2001) and oceanic waters (spring and summer surveys, 2003-2004), which is 37,611 (CV=0.28). This estimate is considered the best because these surveys have the most complete coverage of the species' habitat. The status of Atlantic spotted dolphins in the northern Gulf of Mexico, relative to OSP, is unknown.

Western North Atlantic Atlantic spotted dolphins are distributed in tropical and warm temperate waters of the western North Atlantic (Leatherwood *et al.* 1976). Their distribution ranges from southern New England, south through the Gulf of Mexico and the Caribbean to Venezuela (Leatherwood *et al.* 1976; Perrin *et al.* 1994). The best recent abundance estimate for Atlantic spotted dolphins is the sum of the estimates from the two 2004 western U.S. Atlantic surveys. This joint estimate (3,578+47,400=50,978) is considered best because these two surveys together have the most complete coverage of the species' habitat. The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the lognormally distributed best abundance estimate. This is equivalent to the 20th percentile of the log-normal distribution as specified by Wade and Angliss (1997). The best abundance estimate is 50,978 (CV=0. 42). The minimum population estimates based on the combined abundance estimates is 36,235. The status of Atlantic spotted dolphins relative to OSP in the U.S. Atlantic EEZ is unknown.

Spinner Dolphin (*Stenella longirostris*)

The spinner dolphin is distributed worldwide in tropical to temperate oceanic waters (Leatherwood and Reeves 1983; Perrin and Gilpatrick 1994b). The species is not listed as threatened or endangered under the Endangered Species Act. There are insufficient data to determine the population trends for this species.

Gulf of Mexico Sightings of these animals in the northern Gulf of Mexico occur in oceanic waters (Mullin and Fulling 2004). Annual cetacean surveys were conducted along a fixed plankton sampling trackline. Survey effort-weighted estimated average abundance of spinner dolphins for all surveys combined was 6,316 (CV=0.43) (Hansen *et al.* 1995). Similar surveys were conducted during spring from 1996 to 2001 (excluding 1998) in oceanic waters of the northern Gulf of Mexico. Due to limited survey effort in any given year, survey effort was pooled across all years to develop an average abundance estimate. The estimate of abundance for spinner dolphins in oceanic waters, pooled from 1996 to 2001, was 11,971 (CV=0.71) (Mullin and Fulling 2004). The estimate of abundance for spinner dolphins in oceanic waters, pooled from 2003 to 2004, was 1,989 (CV=0.48) (Mullin 2007), which is the best available abundance estimate for this species in the northern Gulf of Mexico. The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normal distributed abundance estimate. This is equivalent to the 20th percentile of the log-normal distributed abundance estimate as specified by Wade and Angliss (1997). The best estimate of abundance for spinner dolphins is 1,989

(CV=0.48). The minimum population estimate for the northern Gulf of Mexico is 1,356 spinner dolphins. The status of spinner dolphins in the northern Gulf of Mexico, relative to OSP, is unknown.

Western North Atlantic This is presumably an offshore, deep-water species (Schmidly 1981; Perrin and Gilpatrick 1994), and its distribution in the Atlantic is very poorly known. In the western North Atlantic, these dolphins occur in deep water along most of the U.S. coast south to the West Indies and Venezuela, including the Gulf of Mexico. The numbers of spinner dolphins off the U.S. or Canadian Atlantic coast are unknown, and seasonal abundance estimates are not available for this stock since it was rarely seen in any of the surveys. Present data are insufficient to calculate a minimum population estimate. The status of spinner dolphins, relative to OSP, in the U.S. western North Atlantic EEZ is unknown.

Bottlenose Dolphin (*Tursiops truncatus*)

Gulf of Mexico The status of bottlenose dolphins in the northern Gulf of Mexico, relative to OSP, is unknown. The species is not listed as threatened or endangered under the Endangered Species Act. There are insufficient data to determine the population trends for this species. The minimum population estimate for the northern Gulf of Mexico is 13,667 bottlenose dolphins.

1) Continental Shelf: The Gulf of Mexico continental shelf bottlenose dolphin stock inhabits waters from 20 to 200 m deep in the northern Gulf from the U.S.-Mexican border to the Florida Keys. As recommended in the GAMMS Workshop Report (Wade and Angliss 1997), estimates using data older than 8 years are deemed unreliable, and therefore should not be used for PBR determinations. Therefore, the best abundance estimate of bottlenose dolphins was based on data pooled from 2000 through 2001 for continental shelf vessel surveys and was 17,777 (CV=0.32) (see Fulling *et al.* 2003). This estimate is also considered the best because these surveys have the most complete coverage of the species' habitat. The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normal distributed abundance estimate. This is equivalent to the 20th percentile of the log-normal distributed abundance estimate as specified by Wade and Angliss (1997). The best estimate of abundance for bottlenose dolphins is 17,777 (CV=0.32).

2) Coastal: Bottlenose dolphins inhabit coastal waters throughout the northern Gulf of Mexico (Mullin *et al.* 1990). The current minimum population size for each stock is unknown. The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normally distributed abundance estimate. This is equivalent to the 20th

percentile of the log-normal distribution as specified by Wade and Angliss (1997). The status of each stock relative to OSP is not known and population trends cannot be determined due to insufficient data.

3) Oceanic: The estimate of abundance for bottlenose dolphins in oceanic waters, pooled from 1996 to 2001, was 2,239 (CV=0.41) (Mullin and Fulling 2004) Because most of the data for estimates prior to 2003 were older than this 8-year limit and due to the different sampling strategies, estimates from the 2003 and 2004 surveys were considered most reliable. The estimate of abundance for bottlenose dolphins in oceanic waters, pooled from 2003 to 2004, was 3,708 (CV=0.42) (Mullin 2007), which is the best available abundance estimate for this species in the northern Gulf of Mexico. The status of bottlenose dolphins, relative to OSP, in the U.S. Gulf of Mexico oceanic waters is unknown.

Western North Atlantic There are two morphologically and genetically distinct bottlenose dolphin morphotypes (Duffield *et al.* 1983; Duffield 1986) described as the coastal and offshore forms. Both inhabit waters in the western North Atlantic Ocean (Hersh and Duffield 1990; Mead and Potter 1995; Curry and Smith 1997) along the U.S. Atlantic coast.

1) Offshore: The best available estimate for offshore morphotype bottlenose dolphins is the sum of the estimates from the June-July 2002 aerial survey covering the continental shelf, the summer 2004 vessel survey south of Maryland, and the summer 2004 vessel and aircraft surveys north of Maryland. This joint estimate provides complete coverage of the offshore habitat from central Florida to Canada during summer months. The combined abundance estimate from these surveys is 81,588 (CV=0.17). The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normally distributed best abundance estimate. This is equivalent to the 20th percentile of the log-normal distribution as specified by Wade and Angliss (1997). The minimum population estimate for western North Atlantic offshore bottlenose dolphin is 70,775. The status of this stock relative to OSP in the U.S. Atlantic EEZ is unknown. The western North Atlantic offshore bottlenose dolphin is not listed as threatened or endangered under the Endangered Species Act. There are insufficient data to determine the population trends for this species.

2) Coastal: The coastal morphotype of bottlenose dolphin is continuously distributed along the Atlantic coast south of Long Island, New York around the Florida peninsula and along the Gulf of Mexico coast. The minimum population size (Nmin) for each stock was calculated as the lower bound of the 60% confidence interval for a log-normally distributed mean (Wade and Angliss 1997). The coastal migratory stock was designated as depleted

under the MMPA. From 1995 to 2001, NMFS recognized only a single migratory stock of coastal bottlenose dolphins in the WNA, and the entire stock was listed as depleted. This stock structure was revised in 2002 to recognize both multiple stocks and seasonal management units. The prospective stocks described here replace these management units. This prospective stock structure continues to be evaluated using available data and will be finalized when these analyses are complete. The species is not listed as threatened or endangered under the Endangered Species Act, but these are strategic stocks due to the depleted listing under the MMPA.

Fraser's Dolphin (*Lagenodelphis hosei*)

Fraser's dolphin is distributed worldwide in tropical waters (Perrin *et al.* 1994c). The species is not listed as threatened or endangered under the Endangered Species Act. There are insufficient data to determine the population trends for this species.

Gulf of Mexico Sightings in the northern Gulf of Mexico occur in oceanic waters (>200 m) (Figure 1). Fraser's dolphins have been observed in the northern Gulf of Mexico during all seasons (Leatherwood *et al.* 1993; Hansen *et al.* 1996; Mullin and Hoggard 2000). Due to limited survey effort in any given year, survey effort was pooled across all years to develop an average abundance estimate. The estimate of abundance for Fraser's dolphins in oceanic waters, pooled from 1996 to 2001, is 726 (CV=0.70) (Mullin and Fulling 2004), which is the best available abundance estimate for this species in the northern Gulf of Mexico. The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normal distributed abundance estimate. This is equivalent to the 20th percentile of the log-normal distributed abundance estimate as specified by Wade and Angliss (1997). The best estimate of abundance for Fraser's dolphins is unknown. The minimum population estimate for the northern Gulf of Mexico for Fraser's dolphins is unknown. The status of Fraser's dolphins in the northern Gulf of Mexico, relative to OSP, is unknown.

Western North Atlantic The numbers of Fraser's dolphins off the U.S. or Canadian Atlantic coast are unknown, and seasonal abundance estimates are not available for this stock, since it was rarely seen in any surveys. Present data are insufficient to calculate a minimum population estimate for this stock. The status of Fraser's dolphins relative to OSP in the U.S. western North Atlantic EEZ is unknown.

Clymene Dolphin (*Stenella clymene*)

The Clymene dolphin is endemic to tropical and sub-tropical waters of the

Atlantic (Leatherwood and Reeves 1983; Perrin and Mead 1994). The species is not listed as threatened or endangered under the Endangered Species Act. There are insufficient data to determine population trends for this stock.

Gulf of Mexico Sightings of these animals in the northern Gulf of Mexico occur primarily over the deeper waters off the continental shelf (Mullin *et al.* 1994). The estimate of abundance for Clymene dolphins in oceanic waters, pooled from 2003 to 2004, was 6,575 (CV=0.36) (Mullin 2007), which is the best available abundance estimate for this species in the northern Gulf of Mexico. The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normal distributed abundance estimate. This is equivalent to the 20th percentile of the log-normal distributed abundance estimate as specified by Wade and Angliss (1997). The best estimate of abundance for Clymene dolphins is 6,575 (CV=0.36). The minimum population estimate for the northern Gulf of Mexico is 4,901 Clymene dolphins. The status of Clymene dolphins in the northern Gulf of Mexico, relative to OSP, is unknown. There are insufficient data to determine the population trends for this species.

Western North Atlantic Four Clymene dolphin groups were sighted during summer 1998 in the western North Atlantic (Mullin and Fulling 2003), and two groups were sighted in the same general area during a 1999 bottlenose dolphin survey (NMFS unpublished). These sightings and stranding records (Fertl *et al.* 2003) indicate that this species routinely occurs in the western North Atlantic. The best estimate of abundance for the Clymene dolphin was 6,086 (CV=0.93) (Mullin and Fulling 2003) and represents the first and only estimate to date for this species in the U.S. Atlantic EEZ. No minimum population estimate is available at this time. The status of Clymene dolphins, relative to OSP, in the EEZ is unknown.

Blainville's Beaked Whale (*Mesoplodon densirostris*)

Blainville's beaked whales appear to be widely but sparsely distributed in temperate and tropical waters of the world's oceans (Leatherwood *et al.* 1976; Leatherwood and Reeves 1983). The estimate of abundance for *Mesoplodon* spp. in oceanic waters, pooled from 2003 to 2004, was 57 (CV=1.40) (Mullin 2007), which is the best available abundance estimate for these species in the northern Gulf of Mexico. This is a combined estimate for Blainville's beaked whale and Gervais' beaked whale. The estimate for the same time period for unidentified Ziphiidae was 337 (CV=0.40), which may also include an unknown number of Cuvier's beaked whales. The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normal distributed abundance estimate. This is equivalent to the 20th percentile of the log-normal distributed abundance estimate as

specified by Wade and Angliss (1997). The best estimate of abundance for *Mesoplodon* spp. is 57 (CV=1.40). The minimum population estimate for *Mesoplodon* spp. in the northern Gulf of Mexico is 24. The status of Blainville's beaked whales or other beaked whales in the northern Gulf of Mexico, relative to OSP, is unknown. The species is not listed as threatened or endangered under the Endangered Species Act. There are insufficient data to determine the population trends for this species.

Cuvier's Beaked Whale (*Ziphius cavirostris*)

Cuvier's beaked whales are distributed throughout the world's oceans except for the polar regions (Leatherwood and Reeves 1983; Heyning 1989).The distribution of Cuvier's beaked whales is poorly known, and is based mainly on stranding records (Leatherwood *et al.* 1976). This species is not listed as threatened or endangered under the Endangered Species Act.

Gulf of Mexico Beaked whales were seen in all seasons during GulfCet aerial surveys of the northern Gulf of Mexico (Hansen *et al.* 1996; Mullin and Hoggard 2000). The estimate of abundance for Cuvier's beaked whales in oceanic waters, pooled from 2003 to 2004, was 65 (CV=0.67) (Mullin 2007), which is the best available abundance estimate for this species in the northern Gulf of Mexico. The estimate for the same time period for unidentified Ziphiidae was 337 (CV=0.40), which may also include an unknown number of *Mesoplodon* spp. The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normal distributed abundance estimate. This is equivalent to the 20th percentile of the log-normal distributed abundance estimate as specified by Wade and Angliss (1997). The best estimate of abundance for Cuvier's beaked whales is 65 (CV=0.67). The minimum population estimate for the northern Gulf of Mexico is 39 Cuvier's beaked whales. The status of Cuvier's beaked whales in the northern Gulf of Mexico, relative to OSP, is unknown.

Western North Atlantic The best abundance estimate for beaked whales is the sum of the estimates from the two 2004 U.S. Atlantic surveys, 3,513 (CV=0.63), where the estimate from the northern U.S. Atlantic is 2,839 (CV=0.78), and from the southern U.S. Atlantic is 674 (CV=0.36). This joint estimate is considered best because together these two surveys have the most complete coverage of the species' habitat. The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normally distributed best abundance estimate. This is equivalent to the 20th percentile of the log-normal distribution as specified by Wade and Angliss (1997). The best estimate of abundance for undifferentiated beaked whales is 3,513 (CV=0.63). The minimum population estimate for the undifferentiated complex of beaked whales (*Ziphius* and *Mesoplodon* spp.) is

2,154. It is not possible to determine the minimum population estimate of only Cuvier's beaked whales. The status of Cuvier's beaked whale relative to OSP in the U.S. Atlantic EEZ is unknown.

Gervais' Beaked Whale (*Mesoplodon europaeus*)

Gervais' beaked whales appear to be widely but sparsely distributed in temperate and tropical waters of the world's oceans (Leatherwood *et al.* 1976; Leatherwood and Reeves 1983). Beaked whales were seen in all seasons during GulfCet aerial surveys of the northern Gulf of Mexico from 1992 to 1998 (Hansen *et al.* 1996; Mullin and Hoggard 2000). The estimate of abundance for *Mesoplodon* spp. in oceanic waters, pooled from 2003 to 2004, was 57 (CV=1.40) (Mullin 2007), which is the best available abundance estimate for these species in the northern Gulf of Mexico. This is a combined estimate for Blainville's beaked whale and Gervais' beaked whale. The estimate for the same time period for unidentified Ziphiidae was 337 (CV=0.40), which may also include an unknown number of Cuvier's beaked whales. The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normal distributed abundance estimate. This is equivalent to the 20th percentile of the log-normal distributed abundance estimate as specified by Wade and Angliss (1997). The best estimate of abundance for *Mesoplodon* spp. is 57 (CV=1.40). The minimum population estimate for *Mesoplodon* spp. in the northern Gulf of Mexico is 24. The status of Gervais' beaked whales or other beaked whales in the northern Gulf of Mexico, relative to OSP, is unknown. The species is not listed as threatened or endangered under the Endangered Species Act. There are insufficient data to determine the population trends for this species.

Mesoplodont Beaked Whale (*Mesoplodon* spp.)

Within the genus *Mesoplodon*, there are four species of beaked whales that reside in the northwest Atlantic. These include True's beaked whale, *Mesoplodon mirus*; Gervais' beaked whale, *M. europaeus*; Blainville's beaked whale, *M. densirostris*; and Sowerby's beaked whale, *M. bidens* (Mead 1989). These species are difficult to identify to the species level at sea; therefore, much of the available characterization for beaked whales is to genus level only. Stock structure for each species is unknown. The total number of *Mesoplodon* spp. beaked whales off the eastern U.S. and Canadian Atlantic coast is unknown. However, several estimates of the undifferentiated complex of beaked whales (*Ziphius* and *Mesoplodon* spp.) from selected regions are available for select time periods (Barlow *et al.* 2006). Sightings are almost exclusively in the continental shelf edge and continental slope areas. The best abundance estimate for beaked whales is

the sum of the estimates from the two 2004 U.S. Atlantic surveys, 3,513 (CV=0.63), where the estimate from the northern U.S. Atlantic is 2,839 (CV=0.78), and from the southern U.S. Atlantic is 674 (CV=0.36). This joint estimate is considered best because together these two surveys have the most complete coverage of the species' habitat. The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normally distributed best abundance estimate. This is equivalent to the 20th percentile of the log-normal distribution as specified by Wade and Angliss (1997). The best estimate of abundance for undifferentiated beaked whales is 3,513 (CV=0.63). The minimum population estimate for the undifferentiated complex of beaked whales (*Ziphius* and *Mesoplodon* spp.) is 2,154. It is not possible to determine the minimum population estimate of only *Mesoplodon* beaked whales. The status of *Mesoplodon* beaked whales relative to OSP in U.S. Atlantic EEZ is unknown. These species are not listed as threatened or endangered under the Endangered Species Act.